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FISHERIES AND AQUATIC MANAGEMENT

ROCKY MOUNTAIN NATIONAL PARK

2000

UNITED STATES DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service
Colorado Fish and Wildlife
Assistance Office

National Park Service
Rocky Mountain National
Park

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FISHERIES AND AQUATIC MANAGEMENT

ROCKY MOUNTAIN NATIONAL PARK

2000

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FISHERIES AND AQUATIC MANAGEMENT PROGRAM
ROCKY MOUNTAIN NATIONAL PARK
2000

INTRODUCTION AND SUMMARY

Rocky Mountain National Park (RMNP) consists of 106,190 hectares of alpine habitat located 103 kilometers northwest of Denver, Colorado. Aquatic resources of RMNP consist of approximately 147 lakes and 702 km of streams that host up to 108,000 angler days each year.

Due to the elevation of RMNP, the waters of the Park are cold, clear and limited in their ability to produce large annual increases in fish growth. Although annual fish growth is limited, the cold temperatures can extend the life span of lake fish to over 15 years. One exceptional cutthroat trout in Lake Nokoni (3,285 m), reached a length of 635 mm (25 inches) over a life span that exceeded 15 years. However, most high elevation RMNP lake fish do not exceed 406 mm (16 inches) in length.

The growing season for RMNP riparian vegetation and aquatic invertebrates is also limited, and results in slow growth and recovery rates for terrestrial damage and impacts due to angler harvest.

Rocky Mountain National Park (RMNP), and the U.S. Fish and Wildlife Service (FWS) cooperate to maintain aquatic resources and promote native fish species within RMNP. Specific objectives of the RMNP aquatic management program include:

1. Protect and restore native fish populations, and meet the requirements of the Endangered Species Act, 1973. Greenback and Colorado River cutthroat trout are the only trout native to RMNP. In 1973 less than 2,000 pure greenbacks in two populations were known to remain within Colorado. Greenbacks are currently Federally listed as a Threatened species. Good representatives of greenbacks have been identified or introduced into 34 sites within RMNP, with 30 of these sites currently open to fishing. It is estimated that Colorado River cutthroats currently occupy less than 5% of their original range in Colorado, Wyoming and Utah. They were petitioned for listing under the Endangered Species Act in late 1999 (Center for Biological Diversity 1999). Good representatives of Colorado River cutthroat trout have been identified or introduced into 13 sites within RMNP, with 10 of these sites open to fishing.

2. Complete surveys within RMNP to monitor the distribution, condition and abundance of fish and aquatic habitat within RMNP. Stocking of non-native fish into RMNP waters ended in 1969, with about 50 lakes and 40 streams currently supporting populations of fish. Issues such as human impacts, disease (especially whirling disease) and global warming warrant constant monitoring.

3. Allow angler use according to NPS policy, and within limits necessary to perpetuate fish populations and riparian vegetation. Currently, about 108,000 angler days are expended each year within RMNP. Anglers caught an average of 1.39 fish per angler hour on the east side of RMNP, and 3.28 fish per angler hour on the west side of RMNP in 1999. Cutthroat trout were reported as the majority of fish caught on the both the east and west sides. Although anglers may keep non-native species such as brook, brown, rainbow, and non-greenback cutthroat trout, RMNP anglers reported releasing 94.6% of these species caught on the east side of RMNP, and 95.4% of these species caught on the west side of RMNP during 1999.

Funding

To complete these objectives, both RMNP and the FWS contributed funds and personnel through 1988. The Colorado Fish and Wildlife Assistance Office received no FWS funding for greenback restoration work from 1988 to 1999. As a result of this, the FWS did not station a FWS fisheries technician within RMNP from 1989 to 1997. In 1996, RMNP was authorized by Congress and the National Park Service Washington Headquarters to raise entrance fees as part of the Recreation Fee Demonstration Project. Eighty percent of these fees stay within RMNP. This funding has allowed new native trout restoration work within RMNP, and allowed for a FWS fisheries technician to be stationed in the park since 1998.

Acknowledgements

We would like to acknowledge the funding received from RMNP that has supported the restoration work for greenback cutthroat trout since 1989. Also, the RMNP Resources Management staff, RMNP District Rangers and their staffs and the Alpine Anglers Chapter of Trout Unlimited for their assistance in conducting fisheries surveys and collecting creel survey data. A special acknowledgement should be given to Jim Mullan, FWS, who along with Dave Stevens, RMNP, initiated the current RMNP greenback and Colorado River cutthroat trout restoration program; Crystal Hudson and her staff at the FWS Fish Health Center in Bozeman, Montana for conducting disease sampling within RMNP; and Dr. Robert Behnke and Don Proebstel, Colorado State University, for their advice and expertise on taxonomic and management issues.

Fisheries and Aquatic Management Report Format

The entire RMNP report is not totally re-written each year, but is updated and significant reports appended. The RMNP Fisheries and Aquatic Management Report is divided into three sections (Fisheries Management, Angler Use and Management of Native Fish Species) with these sections summarized in the Introduction and Summary section of this report (pages 2-9). Those readers who desire more details on the aspects of Fisheries Management, Angler Use and/or Management of Native Fish Species should see Sections I, II and III of this report (pages 21-186).

SUMMARY OF ROCKY MOUNTAIN NATIONAL PARK FISHERIES MANAGEMENT

History and Aquatic Surveys

Rocky Mountain National Park (RMNP) consists of 106,190 hectares of alpine habitat located 103 kilometers northwest of Denver, Colorado. Aquatic resources of RMNP consist of approximately 147 lakes and 702 km of streams that host up to 108,000 angler days each year.

Due to the elevation of RMNP, and barriers to fish migration within RMNP, it is probable that many of the waters within RMNP were originally fishless. However, the original distribution of fishes within RMNP was not documented prior to 1925. As with most waters within Colorado, the stocking of native and non-native fish species to establish and maintain harvestable populations of trout in RMNP waters probably started in the late 1800's, and continued to 1969.

The current RMNP fisheries management objectives were established in 1969, when the stocking of all species of non-native and hybrids of native fish to maintain artificial fish populations was abandoned. Lakes not capable of maintaining reproducing fish populations were allowed to revert to their fishless status, and emphasis was placed on documenting the status of RMNP aquatic resources. Those waters capable of sustaining reproducing fish populations were to be considered for reintroduction of greenback cutthroat trout, Colorado River cutthroat trout and other RMNP native fish species.

Of the 147 lakes within RMNP, about 58 lakes contained fish populations maintained by natural reproduction and the stocking of trout by 1969. The stocking of non-native trout ended in 1969, but due to the cold water temperatures of RMNP, non-native fish stocked into some of the higher lakes of RMNP survived for nearly 15 years. Currently, about 52 RMNP lakes are populated with fish, but only about 47 of the RMNP lakes are capable of supporting successful reproduction of trout each year, Tables 1 and 2.

An aquatic survey program was conducted in RMNP from 1970 to 1989. Although the purpose of the program was to document the distribution of all the fish species and the condition of aquatic habitats, the program led to the discovery of several native fish populations within RMNP, including Hunters Creek, Upper Hutcheson Lake, Middle Hutcheson Lake and Columbine Creek. Also, the downstream movement of greenbacks from headwater restoration projects into the Moraine Park area of the Big Thompson River, and into the Fall River below Fan Lake was documented.

See Section I, page 21, and Tables 1 through 9, for additional information on the distribution of the fish populations within RMNP.

SUMMARY OF ROCKY MOUNTAIN NATIONAL PARK ANGLER USE

Recreational fishing is allowed within RMNP "when consistent with the restoration and perpetuation of the natural aquatic environment and aquatic life". Angler use surveys conducted in the 1970's estimated that up to 50,000 angler days were expended each year within RMNP. Exit surveys conducted in 1994 and 1995, indicated fishing was the “main activity" of 3.6% of the visitors surveyed. With park visitation at 3 million people, approximately 108,000 visitors currently fish RMNP each year. Rocky Mountain National Park does not issue, nor require a special RMNP permit to fish RMNP waters, but a valid Colorado fishing license is required for all persons over 14 years of age.

Anglers are allowed to harvest up to 18 brook trout per day (ten of which must be under 203 mm (8 inches)), but only two rainbow, brown and non-greenback cutthroats over 250 mm in length may be harvested by an angler each day. Fishing for greenback cutthroat trout (Federally Threatened species) is currently limited to catch-and-release fishing only. See Appendix 4 for RMNP fishing regulations.

Creel Survey Program. The current RMNP creel survey program has been conducted since 1984, to assess angler success, fish population numbers and distribution of species. Information is gathered by FWS technicians, RMNP rangers, permitted fishing guides and volunteers by having anglers fill out volunteer angler report cards. Based upon data collected by the RMNP creel survey program, RMNP anglers caught a yearly average of 1.13 to 3.18 fish per angler hour, with individual waters ranging from 0.0 to 22.0 fish per hour on the east side of RMNP from 1984 through 1999 (Tables 16-45). On the west side of RMNP anglers reported catching a yearly average of 0.88 to 25.0 fish per angler hour, with individual waters ranging from 0.0 to 36.0 fish per hour from 1984 through 1999 (Tables 16-45).

Data collected by the RMNP creel survey program has shown a steady increase in the percentage of fish released by anglers since anglers were first asked to report release of fish in 1985. Both the east and west sides had release rates over 95% for all fish species caught by anglers interviewed in 1999. On the east side of the park, the release rate has been over 90% since 1992.

Although some RMNP waters are designated as catch-and-release only areas, anglers also appear to be keeping less than their legal limit of non-greenback trout caught within RMNP waters. RMNP anglers may keep a cumulative total of two rainbow, brown and/or non-greenback cutthroat trout over 10 inches in length and up to 18 brook trout per day. Anglers reported releasing 94.6% of the fish which are legal to harvest on the east side of RMNP, and 95.4% of legally harvestable fish on the west side in 1999. Along the heavily fished sections of the Big Thompson River through Moraine Park and the Colorado River, anglers reported releasing 100% of the fish they caught in 1997 and 1998. In 1999, 96.2 % of the fish caught in the Big Thompson River were released and 97.4 % of fish caught in the Colorado River were released.

Native Species Angling Program

Greenback Cutthroat. Currently 30 sites in RMNP are open to angling for greenback cutthroat trout, with 14 of these sites opening since 1990. Catch rates for greenback waters ranged from 0 to 12 greenbacks per angler hour in 1999. Dream Lake, the latest restoration project, opened to catch and release angling in 1999 with anglers reporting catching 2.5 greenbacks per angler hour.

Colorado River Cutthroat. Currently 10 sites containing Colorado River cutthroat trout are open for angling. Creel data was collected from only three of these sites in 1999. Anglers reported catching 3.35 cutthroats/hour at Lake Nanita, with 93.9% of fish caught being released. At upper Onahu Creek nine cutthroats were caught in 15 minutes of angling and two cutthroats/hour were reported caught in Paradise Creek.

See Section II, page 27, and Tables 16 through 45 for further information regarding RMNP Angler Use.

SUMMARY OF ROCKY MOUNTAIN NATIONAL PARK MANAGEMENT OF NATIVE FISHES

Greenback Cutthroat Trout.

At the time of the enactment of the Endangered Species Act in 1973, only two small historic populations of greenbacks were known to remain within Colorado. These two historic populations represented 6.4 kilometers of stream and less than 2,000 greenbacks. Due to the small number of greenbacks known to remain in 1973, the species was originally listed as Endangered. In 1978, the sub-species was downlisted to Threatened to facilitate recovery efforts.

Status of Greenback Cutthroat Trout. Pure greenback cutthroat trout have been identified, or introduced into 34 sites within RMNP. Six of these sites represent historic populations found within RMNP, and 25 sites (17 lakes habitats and 8 stream habitats) are introduction sites completed since 1958. Five of these sites, Crystal Lake, Lake Louise, Lake Husted, Loomis Lake and Lily Lake are experimental introductions where the reproduction of cutthroat trout every year is uncertain.

Rocky Mountain National Park Greenback Cutthroat Trout Waters, 2000*.

Area	Comments
1. South Fork Poudre River	Small historic A population, closed to fishing. Managed as broodstock refugium. Most of this population is outside of RMNP.
2. Hunters Creek	Good historic A population, closed to fishing. Managed as broodstock refugium.
3. Upper Hutcheson Lake	Good historic A population, open to catch-and-release fishing.
4. Middle Hutcheson Lake	Small historic A population, open to catch-and-release fishing.
5. Hague Creek-Upper	Small historic A- population, open to fishing.
6. Hague Creek-Hazeline Tributary	Small historic B+ population, open to fishing. BKT present.
7. Caddis Lake	Good A restoration population, open to fishing in 1962.

8. North Fork Big Thompson River above 3274 m	Small restoration A population, opened to catch-and-release fishing in 1990.
9. Hidden Valley Creek	Declining A restoration population, opened to catch-and-release fishing in 1982. BKT dominate. Scheduled for restoration again in the near future.
10. Bear Lake	Good A restoration population, closed to fishing due to user conflicts.
11. West Creek	Small A restoration population, currently closed to fishing.
12. Ouzel Lake	Good A restoration population, opened to catch-and-release fishing in 1986. BKT present.
13. Ouzel Creek	Declining A restoration population, open to catch-and-release fishing in 1986. BKT in majority in lower section.
14. Fern Lake	Good A restoration population, opened to catch-and-release fishing in 1986.
15. Fern Creek	Good A restoration population, opened to catch-and-release fishing in 1986.
16. Odessa Lake	Small A restoration population, opened to catch-and-release fishing in 1987.
17. Lawn Lake	Good A restoration population, opened to catch-and-release fishing in 1988.
18. Crystal Lake	Experimental A population, opened to catch-and-release fishing in 1990.
19. Roaring River	Good A restoration population, opened to catch-and-release fishing in 1991.
20. Lost Lake	Small A restoration population, opened to catch-and-release fishing in 1990.
21. North Fork Big Thompson Above Lost Falls	Good A restoration population, opened to catch-and-release fishing in 1990. BKT present.
22. Lower Hutcheson Lake	Small A restoration population, opened to catch-and-release

	fishing in 1991.
23. Sandbeach Lake	Small A restoration population, opened to catch-and-release fishing in 1991.
24. Pear Lake	Good A restoration population, opened to catch-and-release fishing in 1991.
25. Cony Creek	Good A restoration population, opened to catch-and-release fishing in 1991.
26. Lake Louise	Experimental A population, opened to catch-and-release fishing in 1994.
27. Lake Husted	Experimental A population, opened to catch-and-release fishing in 1995.
28. Spruce Lake	Good A restoration population, opened to catch-and-release fishing in 1993.
29. Loomis Lake	Experimental A population, opened to catch-and-release fishing in 1993
30. Lily Lake	Experimental A population, open to catch-and-release fishing.
31. Dream Lake	New A restoration population. Status unknown, opened to catch-and-release fishing in 1999.
32. Big Thompson River Forest Canyon	Good historic A- population, open to fishing.
33. Arrowhead Lake	Small stocked A- population, open to fishing.
34. Ypsilon Lake	Good historic A- population, open to fishing.

* Alphabetical ratings based on Binns rating system (A=pure stock, B=essentially pure, some hybrid influence or stocking history). For a further explanation of this rating system see Appendix 3.

Restoration Projects. In 1996, hybrid cutthroat trout were removed from Dream Lake. The lake was restocked with 190 adult and 5 immature greenback cutthroat trout by helicopter from Upper Hutcheson Lake in 1997.

Lake Haiyaha is the next site proposed for restoration. Other areas proposed for restoration in the near future are Hidden Valley Creek, Mummy Pass Creek and Poudre Lake/Cache la Poudre River/Chapin Creek.

Greenback Broodstock and Stocking Program. Currently, the future of the greenback broodstock program is uncertain. The broodstock which was housed at the CDOW Experimental Fish Hatchery in Fort Collins, Colorado tested positive for whirling disease in 1996. The hatchery has been disinfected, and appears to be free of whirling disease.

Colorado River Cutthroat Trout

The Colorado River cutthroat trout's historic range included the western half of Colorado, the eastern half of Utah, southwestern Wyoming and small parts of Arizona and New Mexico. By 1979, it was estimated that good representatives of the subspecies were found in less than 1% of its historic range due to overharvesting, dewatering, pollution, siltation and most significantly introduction of non-native trout which outcompeted and hybridized with the cutthroats (Trotter 1987). Currently it is estimated that they occupy 5% of their historic range. Colorado River cutthroat trout were petitioned for listing under the Endangered Species Act in late 1999 (Center for Biological Diversity 1999).

Status of Colorado River Cutthroat Trout. Colorado River cutthroat trout have been identified or introduced into 13 sites (eight historic, four restoration and one stocked) within RMNP. Non-native cutthroats were removed from Timber Lake and Timber Creek in 1979, and the area restocked with Colorado River cutthroat trout from Clinton Gulch. Yellowstone cutthroats were removed from Bench Lake and Ptarmigan Creek above War Dance Falls in 1985, and the area restocked with adult Trappers Lake strain of Colorado River cutthroat trout from Williamson Lakes, California in 1987. Both populations are in good condition.

Rocky Mountain National Park Colorado River Cutthroat Trout Waters, 2000.

	Area	**Comments**
1.	Lake Nanita	Excellent historic A population, open to fishing and harvest. Used as broodstock.
2.	Adams Lake	Small historic A population, open to catch-and-release fishing.
3.	Timber Lake	Small A restoration population, opened to catch-and-release fishing in 1987.
4.	Timber Creek	Good A restoration population, opened to catch-and-release fishing in 1987.
5.	Bench Lake	Good A restoration population, closed to fishing. Will be used as broodstock in near future.

6. Ptarmigan Creek	Good A restoration population, closed to fishing.
7. Paradise Creek	Good historic A-/B population, open to catch-and-release fishing.
8. Fifth Lake	Small historic A- population, open to catch-and-release fishing.
9. Columbine Creek	Small historic A- population, closed to fishing.
10. Onahu Creek	Small historic A- population, open to fishing.
11. Boundary Lake	Small stocked B+ population, open to catch-and-release fishing.
12. Colorado River-Upper	Small historic population, open to fishing. BKT dominate.
13. Willow Creek	Declining historic B+ population, open to fishing. BKT dominate.

Other populations of phenotypic Colorado River cutthroats are in Ten Lakes Park, Lake Solitude and the North Inlet upstream of Hallets Creek.

Restoration Projects. Areas proposed for restoration to pure Colorado River cutthroat trout in the near future are Pettingell Lake and Haynach Lakes.

See Section III, page 37, for further information on Management of Native Fish Species.

SPECIAL STUDIES AND PROJECTS

Minimum Habitat Requirements For Establishing Translocated Cutthroat Trout Populations., Amy L. Harig and Dr. Kurt D. Fausch, Colorado State University.

The goal of this study was to develop models at two scales, stream and basin, for predicting risk of extinction from habitat variables for native cutthroat trout populations in headwater streams. Field work and year long temperature measurements were conducted on six streams in Rocky Mountain National Park, along with 22 other streams throughout Colorado and New Mexico containing translocated (i.e. restored) populations of native greenback and Rio Grande cutthroat trout.

Data collected indicate many of the streams had summer temperatures too cold to support a naturally reproducing population of cutthroat trout. "Cold summer temperatures are known to delay spawning and prolong incubation, resulting in low embryo survival or increased time to fry emergence. Fry that survive and hatch late also may be unable to acclimate quickly enough to rapid drops in water temperature or may starve during winter, so survival may depend on their ability to attain a body size large enough to withstand metabolic deficits." There was a statistically significant difference in summer water temperatures between streams that supported low numbers of cutthroats and those that supported high numbers. Streams surveyed that had low numbers of cutthroat trout had mean daily July water temperatures ≤ 7.8 ° C.

The "best" stream-scale habitat model also included mean pool bankfull width and number of deep pools, in addition to mean July water temperature, indicating habitat size and abundance also are limiting factors for long-term persistence of cutthroat trout. "Larger streams can support larger populations, which are less vulnerable to environmental and demographic stochasticity. Large streams are also more likely to provide enough habitat heterogeneity to meet the diverse habitat needs of salmonids."

The next three best models also included water temperature and mean pool bankfull width with two of these models using total number of pools and pools with physical structure as the third variable indicating that these variables may also limit cutthroat populations. Although the model using July water temperature, mean pool bankfull width and number of deep pools was determined statistically to be the best model, a weighted average of all four models would give greater precision to predict translocation success. However, this greater precision would be only about 3% and the additional time, money and effort needed to acquire data on the other habitat variables would not be justified.

Models developed from basin-scale variables such as watershed area, stream length, elevation, slope, aspect, etc. using Geographic Information Systems and digital map data were not as effective in predicting between successful and unsuccessful translocated populations. Watershed area was the only basin-scale variable which was useful. "Based on model results, watersheds larger than 14.7 km^2 are predicted to have greater than 50% probability of supporting high numbers of cutthroat trout." However, watershed area should only be used only as a coarse filter to predict success of translocated cutthroat populations.

Information on streams surveyed in RMNP can be found in the Management of Native Fish Species section of this report.

Effects of Nonnative Brook Trout on Colorado River Cutthroat Trout Populations., Douglas Peterson and Dr. Kurt D. Fausch, Colorado State University.

The Colorado River cutthroat trout is the native trout of the upper Colorado River basin and has undergone dramatic reductions in both its range and population size. The factors cited as contributing to the subspecies decline include habitat degradation and loss, overfishing, and pollution, but the introduction and subsequent invasion of nonnative salmonids may be the most significant. Introduced rainbow trout readily hybridize with cutthroat species thus diluting the genetic purity. The presence of brook trout in native trout streams usually coincides with the rapid decline of the cutthroat.

However, the factors by which brook trout harm cutthroat populations are largely unknown. Competition has generally been assumed to be the primary factor, but this has not been definitively proven in a natural setting. This four year study attempts to identify the mechanism by which this occurs. Five streams in north central Colorado were selected for the study. One of these streams, Willow Creek, is located within Rocky Mountain National Park. Although recent taxonomic analysis indicates that Willow Creek cutthroats are not Colorado River cutthroats, ecologically it is believed that there is no difference between pure and hybrid cutthroats. Willow Creek along with one other stream were randomly selected as treatment streams and brook trout will be removed from them on an annual basis for the length of the study. The three other streams will serve as control streams.

Four probable mechanisms for the decline of cutthroat populations will be addressed over the course of the study.

1) survival - brook trout cause decreased survival of one or more age classes of cutthroat via competition or predation
2) recruitment - brook trout disrupt cutthroat reproduction, resulting in recruitment failure
3) emigration/immigration - brook trout invasion (immigration) causes movement of cutthroat trout out of the area (emigration)
4) disease - brook trout serve as disease vectors, bringing whirling disease (WD), bacterial kidney disease (BKD), or other pathogens into cutthroat populations they invade

Based on data from the first two years of this study it appears that interspecific competition from brook trout acts most strongly on cutthroats during the first year of life. In a low elevation control stream brook trout young survival was nine times greater than that for cutthroat young. Survival of adult fish differed little between the two species. No age-0 cutthroats were captured by electrofishing in Willow Creek in either 1998 or 1999. A few age-0 cutthroats were observed and captured in September 1999 during trapping operations. However, due to their small size and emaciated condition it was not believed that they could survive the winter.

Most fish (89% of brook trout and 82% of cutthroats) recaptured in electrofishing surveys in 1999 were within 50 m from their 1998 capture site. The remaining recaptures were found to be very mobile. Over 11% of the recaptured cutthroats moved at least 300 m with a maximum detected movement of 600 m, while 4.5% of recaptured brook trout moved at least 300 m with a maximum detected movement of 500 m. Movement of cutthroats was equal between upstream and downstream, while brook trout tended to move upstream. Based on data collected at two-way weirs installed above and below study reaches both cutthroats and brook trout tended to move upstream. However, brook trout move at a significantly greater rate than cutthroats.

Neither whirling disease (WD), nor bacterial kidney disease (BKD), were definitively present in brook trout from the study streams. Cutthroat trout were not sampled for disease, but no clinical signs of WD or BKD were observed.

Mechanisms for Displacement of Greenback Cutthroat Trout by Brook Trout in Montane Streams in Rocky Mountain National Park., Claire C. McGrath, Center for Limnology, Cooperative Institute for Research in Environmental Sciences, University of Colorado at Boulder.

The principal factor contributing to the decline of greenback cutthroat trout has been the introduction of non-native trouts within the South Platte and Arkansas drainages. Displacement of greenback populations by brook trout has been documented most commonly, likely because brook trout is the introduced species with habitat requirements most similar to those of greenback cutthroat trout. While we know that greenbacks cannot coexist with brook trout, the mechanisms for displacement of greenback cutthroat trout are not understood.

This study will investigate two hypotheses: 1) brook trout displace cutthroat trout through competition for food, space or both food and space: and 2) brook trout displace cutthroat trout by preying upon cutthroat trout. Research will be conducted at ten sites (four treatments consisting of two brook trout only and two cutthroat only; three with brook trout and cutthroat trout; and three with brook trout and cutthroat trout with brook trout removed in first year of study) within RMNP. The hypotheses will be tested by capturing fish using a three-pass electrofishing technique and analysis of gut contents and stable isotopes using non-lethal techniques. To test the spatial component of the hypothesis, after removing fish, cutthroat trout will be replaced and their spatial positions will be recorded before and after release of brook trout. In addition, laboratory experiments will be conducted to help to interpret isotope data and population modeling will be done to help predict cutthroat trout population dynamics under particular environmental conditions.

This research will be conducted in 2000 and 2001. Preliminary fieldwork was conducted in 1999 to refine techniques.

Lily Lake Visitor Use Survey., Alpine Anglers Chapter of Trout Unlimited.

Visitor use surveys were conducted at Lily Lake by volunteers from Trout Unlimited (TU) in 1997, 1998 and 1999. Data was collected on the number of users and their activities at Lily Lake on an hourly basis with a daily log form. In 1997, volunteers were present at Lily Lake for all or parts of 25 days from 18 May through 27 July. In 1998, volunteers were present for all or parts of 36 days from 22 May through 7 September. In 1999, volunteers were present for all or parts of 48 days from 21 May through 5 September.

For all three years daily visitor use peaked around mid-day.In 1997 and 1998 overall visitor use peaked around 4 July. In 1999 overall visitor use peaked on June 19. Anglers represented 51.3% of the users in 1997, 26.7% in 1998 and 35.5% in 1999.

For 1997 and 1998, the average number of visitors present at Lily Lake was greater on weekdays than on weekend days. In 1999, the average number of visitors present for weekend days was greater than for weekdays. Based on data collected from TU, the average number of people present per day at Lily Lake was highest in 1998 (100.25 people per day), followed by 1999 (93.71) than 1997 (51.12).

Disease Sampling., conducted by U.S. Fish and Wildlife Service Bozeman Fish Health Center, Bozeman, Montana.

Systematic sampling of RMNP waters began in 1993, with a total of 16 sites tested for disease in

1993 and 1995. Disease testing has also been conducted on several native cutthroat trout populations prior to removal of eggs and milt for transport to areas outside RMNP.

Since 1997 fish from Rocky Mountain National Park have been sampled and tested for disease in selected streams as part of the *National Wild Fish Health Survey* (USFWS 1997), an ongoing effort to monitor wild fish populations for the prevalence of certain fish pathogens. The fish pathogens included in the survey represent organisms which have the potential to cause significant disease epizootics. However, information is limited regarding the distribution, prevalence and impacts that these pathogens may have on wild fish populations. Knowledge gained in survey efforts will contribute to a cohesive national perspective for fish health management. To date, fish from 18 sites within RMNP have been tested and included in the survey.

RMNP *National Wild Fish Health Survey* Target Pathogens (Peters 1998):

Pathogen	**Type**	**Clinical Disease**
Infectious Hematopoietic Necrosis Virus(IHNV)	Virus	IHN
Infectious Pancreatic Necrosis Virus(IPNV)	Virus	IPN
Viral Hemorrhagic Septicemia Virus(VHSV)	Virus	VHS
Aeromonas salmonicida	Bacteria	Furunculosis
Flexibacter psychrophilus	Bacteria	Cold water disease
Renibacterium salmoninarum	Bacteria	Bacterial kidney disease
Yersinia ruckeri	Bacteria	Enteric redmouth disease
Ceratomyxa shasta	Protozoa	Ceratomyxosis
Myxobolus cerebralis	Protozoa	Whirling disease
Bothriocephalus acheilognathi	Metazoa	Asian tapeworm

Significant Results. Since 1995 disease testing has been conducted at 25 sites. Twenty of these sites have tested positive or suspect for *Renibacterium salmoninarum*, the pathogen responsible for bacterial kidney disease (BKD), see table below. ELISA testing is used as a screening test to detect *R. salmoninarum* P57 antigen. Since 1996 the Bozeman Fish Health Center has used polymerase chain reaction (PCR) testing to confirm ELISA results. Though many fish have tested positive for *R. salmoninarum,* no clinical signs of BKD have been observed in any fish sampled.

Seven sites have tested positive for *Myxobolus cerebralis*, the causative organism of salmonid whirling disease (WD), see table below. All of these sites are located in the Fall River drainage through Horseshoe Park or in the Colorado River drainage through the Kawuneeche Valley. These areas contain low gradiant, silt laden waters, which are the preferred habitat for tubifex worms, (intermediate host for *M. cerebralis*). Testing for *M. cerebralis* consists of a pepsin-trypsin digest to screen for the presence of spores, and confirmation using PCR testing. Although *M. cerebralis* has been found within RMNP, no fish that have been sampled in WD positive waters have shown clinical signs of WD.

Significant Results, Disease Testing RMNP, 1995-1999

Year	**Water**	**Species**	***R.. Salmoninarum****	***M. Cerebralis****
1995	Fall River-Cascade Cottages	BNT, BKT	Positive	Negative
	Fall River-bridge crossing	BNT, BKT	Positive	Positive
	Big Thompson River-Mailbox Junction	BNT, BKT	Positive	Negative
	North St. Vrain Creek-park boundary	BNT	Positive	Negative
	Mills Lake	RBT	Positive	Negative
	Hunters Creek	GBC	Negative	Negative
	Colorado River-Sun Valley	BNT	Positive	Positive
	East Inlet-below Adams Falls	BNT, BKT	Positive	Negative
	Tonahutu Creek	BKT, BNT, CUT	Positive	Not tested
	North Inlet	BNT	Positive	Negative
1996	Upper Hutcheson Lake	GBC	Negative	Negative
1997	Fall River-Cascade Cottages	BKT, BNT	Positive	Positive
	Hidden Valley Creek	BKT^	Positive	Negative
	Big Thompson River-Mailbox Junction	BKT, BNT	Suspect	Negative
	The Loch	CUT	Suspect	Not tested
	North St. Vrain Creek-park boundary	BKT, BNT	Suspect	Negative
	Colorado River-Never Summer	BKT, BNT	Positive	Negative
	Colorado River-Sun Valley	BKT, BNT	Negative	Positive
	Timber Creek-Route 36 crossing	BKT	Suspect	Positive
1998	Fall River-Endovalley picnic area	BKT	Positive	Positive
	Roaring River-below Horseshoe Falls	BKT^	Negative	Positive
	Big Thompson River-Fern Lake TH	BKT, RBT	Positive	Negative
		BNT	Suspect	Negative
	Ouzel Creek-above Ouzel Falls	BKT^	Negative	Negative
	Colorado River-Opposition Creek bridge	BNT, BKT, SCU	Suspect	Negative
	Onahu Creek-Route 36 crossing	BKT	Positive°	Positive
	Bench Lake[#]	CRC	Negative	Negative
1999	Cache la Poudre River-upstream of Hague Creek	BKT	Positive°	No results

Hague Creek-Poudre River jct.	BKT	Positive°	No results
Colorado River-Lulu City	BKT	No results	No results
East Inlet-upstream of Echo Creek	BKT	Positive°	No results
Bench Lake[#]	CRC	No results	No results

Species:BKT=brook trout
BNT=brown trout
CUT=hybrid cutthroat trout
RBT=rainbow trout
GBC=greenback cutthroat trout
SCU=mottled sculpin
CRC=Colorado River cutthroat trout

* Screened only in 1995, screened and confirmed using PCR testing 1996-1999.
^ Greenback cutthroat trout also present but not tested.
[#] Not included in *National Wild Fish Health Survey*, 1999 Bench Lake testing conducted by Colorado Division of Wildlife Aquatic Animal Health Laboratory in Brush, CO.
° Not confirmed using PCR as of yet.

Taxonomy of Cutthroat Trout from Rocky Mountain National Park., Don Proebstel, World Salmonid Research Institute and Department of Fishery and Wildlife Biology-Colorado State University.

Cutthroat trout tissue samples were collected from 23 locations within RMNP in 1998 to 1999 and provided to Don Propstel for genetic analysis. For results see Appendix 2.

The fish collected from Bench Lake and Ptarmigan Creek in 1998, were found to be pure specimens of Colorado River cutthroat trout based on meristic characters. Full results can be found in Appendix 1.

ROCKY MOUNTAIN NATIONAL PARK FISHERIES ISSUES

Native Cutthroat Trout Restoration. The National Park Service and FWS recognize that fish are important biological components of the national park system, providing benefits for ecosystem sustainability and recreation. Unfortunately, native cutthroat trout in RMNP are threatened by past introductions of non-native trout. Current fisheries management policies of the National Park Service emphasize the restoration and preservation of natural assemblages of native species.

The pace of the native cutthroat trout restoration program was slowed due to funding problems and problems obtaining fish control permits. If these problems are resolved it is expected that starting in 2001 one greenback restoration and/or one Colorado River cutthroat restoration will be completed each year.

Whirling Disease. Disease sampling was conducted in 1997, 1998 and 1999 as part of an ongoing effort to monitor wild fish populations for the prevalence of certain fish pathogens as part of the *National Wild Fish Health Survey*. *Myxobolus cerebralis*, the causative organism of salmonid whirling disease, was found in all sites located in the lower montane valleys of the Fall River and the Colorado River within RMNP. None of the fish in sites that tested positive showed clinical signs of whirling disease. Fish in these areas need to be monitored for the presence of whirling disease.

Watchable Fish Programs. In Yellowstone National Park more people participate in watchable fish programs than in angling programs (Kaeding *et al.* 1994). Opportunities for watchable fish programs also exist within RMNP, and include greenback spawning at Bear and Lily Lakes, the Hidden Valley Creek boardwalk and the fall spawning run of brook trout in Sprague Lake and brown trout in Baker Creek. Signing these areas to inform visitors of what they are observing or stationing a knowledgeable ranger or interpreter in these areas would provide a much needed public outreach program on fisheries issues.

ROCKY MOUNTAIN NATIONAL PARK FISHERIES RELATED ACTIVITIES, 2000-2005

	Year					
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
FISHERIES MANAGEMENT						
Watchable Fish						
Bear Lake	X					
Hidden Valley		X				
Lily Lake			X			
Sprague Lake				X		
ANGLER USE AND CREEL SURVEY						
Collect creel survey data	X	X	X	X	X	X
NATIVE SPECIES RESTORATION						
Restorations						
Lake Haiyaha		X	X			
Hidden Valley Creek			X	X		
Mummy Pass Creek				X	X	
Poudre Lake/Cache la Poudre River					X	X
Black Lake						X
Pettingell Lake	X	X				
Haynach Lakes		X	X			
Monitor Restoration Projects						
Dream Lake	X	X	X			
Lake Haiyaha				X	X	X
Hidden Valley Creek					X	X
Mummy Pass Creek						X
Pettingell Lake			X	X	X	X
Haynach Lakes				X	X	X

CANDIDATE AQUATIC SPECIES FOR LISTING

Boreal Toad

This species was once common to the southern Rocky Mountains, however its numbers have declined drastically over the past 15 to 20 years (Loeffler 2000). Although the taxonomy of this subspecies of the western toad is not clear, the boreal toad (*Bufo boreas boreas*) has been classified as warranted for listing as a threatened or endangered species under the Endangered Species Act by the FWS, but precluded due to limited resources and other species in greater need of listing. The state of Colorado lists the boreal toad as endangered. The reasons for this decline have not been definitively identified but recent information points to chytrid fungus as being a major factor. Due to this newly identified threat to the boreal toad federal listing may be forthcoming.

Since 1990 the USGS-Biological Resources Division with assistance from RMNP Division of Resources Management and Research has managed and monitored these localities. Currently there are four known boreal toad breeding localities within RMNP.

Status of RMNP breeding localities (Loeffler 2000 and Muths, *pers. comm.* 2000):

Lost Lake. The boreal toad was noted to be common at Lost Lake in the late 1970's, and was studied by the USGS-Biological Resources Division during the 1980's. Brook trout were removed from Lost Lake with antimycin in 1986, but the use of antimycin did not seem to have long term impacts on the boreal toad (Rosenlund *et al.* 1994).

Since 1990 the number of breeding age toads and egg masses observed has fluctuated. This fluctuation is known to be common in amphibian populations. In 1999 there was a ten fold decrease from 1998 in the number of breeding age males observed at Lost Lake. This decrease could be part of the natural population fluctuation or a result of mortality from chytrid fungus and/or other factors. Chytrid fungus has been identified as the cause of death for several toads in the North Fork of the Big Thompson River (i.e. Lost Lake and Kettle Tarn) in 1998. Reproduction has been observed through 1999, however it is very difficult to determine if metamorphs survived the winter.

Kettle Tarn. The number of breeding age toads and egg masses has declined precipitously since 1996. It is not known whether this decline is entirely the result of chytrid fungus or a combination of factors. Reproduction has been observed through 1999, however it is very difficult to determine if metamorphs survived the winter.

Spruce Lake. This locality was discovered in 1992 in a wet meadow downstream from the lake (Rosenlund *et al.* 1994). Since 1996 the USGS has monitored this locality on a limited basis. Recruitment was documented in 1996 and egg masses were found in 1998 and 1999.

Glacier Basin. This site is a translocation experiment that was begun in 1995. Since that time there has been no indication of breeding. Due to funding constraints this site will be monitored for only one more year, 2000.

Boreal toads have also been observed along the South Fork of the Cache la Poudre River, just within RMNP. These toads are associated with the Twin Lake breeding locality located outside RMNP.

Rocky Mountain Capshell

This extremely small aquatic mollusk (<5 mm in diameter) was thought to exist in only 11 sites. These included a lake near Nederland, Colorado, a lake in Glacier National Park, and nine sites within Canada. During 1993, volunteers within RMNP found a new Rocky Mountain capshell population in Finch Lake. Other lakes within RMNP (including Spruce and Twin Lakes) were surveyed, but no additional capshell populations were found. This mollusk is extremely difficult to see and recognize due to its small size, coloration and habit of hiding under rocks.

SECTION I

FISHERIES MANAGEMENT

Electrofishing Survey of the Big Thompson River Through Forest Canyon, 1965

INTRODUCTION AND SUMMARY

HISTORY OF RMNP FISHERIES MANAGEMENT

CURRENT MANAGEMENT OBJECTIVES

LAKE AND STREAM SURVEY PROGRAM

STATUS OF RMNP LAKES

RMNP AQUATIC RESOURCES DATABASE

FALL RIVER

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

INTRODUCTION AND SUMMARY

The aquatic ecosystem of Rocky Mountain National Park (RMNP) consists of approximately 147 lakes (446 ha) and 702 km of stream. The waters are oligotrophic and are accordingly cold, clear and limited in their ability to produce large annual increases in fish growth. Although annual fish growth is limited, the cold temperatures can extend the life span of lake fish to over 15 years. One exceptional cutthroat trout in Lake Nokoni (3,285 m), reached a length of 635 mm (25 inches) over a life span that exceeded 15 years.

Due to the elevation of RMNP, the growing season for RMNP riparian vegetation and aquatic invertebrates is also limited, and results in slow growth and recovery rates for terrestrial damage and impacts due to angler harvest.

Rocky Mountain National Park, and the U.S. Fish and Wildlife Service (FWS) cooperate to protect and restore native fish populations, complete aquatic resource surveys and monitor angling programs within RMNP.

Many fisheries projects were completed from 1977 to 1988, but cooperative FWS/National Park Service (NPS) fisheries work declined from 1988 to 1997 due to limited funding. In 1996 RMNP was authorized by Congress and the NPS Washington Headquarters to raise entrance fees as part of the Recreation Fee Demonstration Project. Eighty percent of the fees stay within the parks in which they were collected. This additional funding will provide for future native trout restorations, and will allow for a FWS fisheries technician to be stationed in RMNP during the summer months.

HISTORY OF RMNP FISHERIES MANAGEMENT

Due to the elevation of RMNP, and barriers to fish migration within RMNP, it is probable that many of the waters within RMNP were originally fishless. However, the original distribution of fishes within RMNP was not documented prior to 1925. As with most waters within Colorado, the stocking of native and non-native fish species to establish and maintain harvestable populations of trout in RMNP waters probably started in the late 1800's, and continued to 1969.

After the establishment of RMNP, a variety of species, including rainbow, brook and "spotted natives" were documented as established in lakes within RMNP by 1925. Those fishless RMNP lakes, or RMNP lakes not "fully stocked" were identified, and scheduled to be stocked with the "best variety". The best variety suitable for stocking RMNP lakes were identified mainly as "spotted natives", "cut-throat native", brook and rainbow trout. However, black bass were selected as the best variety for Cub Lake, and Atlantic salmon were recorded as stocked into Emerald Lake.

Following the establishment of fish hatcheries at Yellowstone Lake and Estes Park, up to 400,000 Yellowstone cutthroat trout fry were stocked annually into RMNP waters through the 1940's, as part of the NPS policy of stocking only "native fish". Although the greenback cutthroat and Colorado River cutthroat trout were native to RMNP waters, the use of any subspecies of cutthroats appeared to meet the NPS policy of stocking only "native species", prior to 1969.

Many of the waters stocked with Yellowstone cutthroat fry contained sizable populations of brook trout, and the Yellowstone cutthroat fry did not survive in most of the lakes dominated by brook trout. By the end of the 1940's, the stocking of high numbers of Yellowstone cutthroat trout was abandoned, since the stocking contributed very little to lake and stream fisheries. However, in some locations, such as Lake Haiyaha, Dream Lake, and possibly Bench Lake, the stocking of Yellowstone cutthroat trout evidently replaced brook trout that were reported to be present prior to the stocking of large numbers of Yellowstone cutthroats.

The Long Range Fisheries Management Plan for Rocky Mountain National Park, Guse and Wallis (1965), redefined management objectives for fisheries, and classified RMNP waters for management purposes. Park waters were divided into three classes, depending upon biological and recreational considerations, with stocking limited to Class III lakes only:

Class I - Waters Not Managed for Sport Fishing

Class II - Waters Managed for Fishing Based Upon Self Supporting Populations of Fish.

Class III - Waters Managed for Fishing Based Upon Populations of Fishes Supplemented by Periodic Stocking

During this period, stocking of fish was limited to cutthroats, but not defined as any sub-species, with lakes stocked with Snake River cutthroat trout and greenback hybrids.

Of the 147 lakes within RMNP, 16 lakes were determined to be Class III lakes, and scheduled for periodic stocking to maintain sport fish populations through 1969. Without stocking, eight of the Class III waters proved to be reproducing fish populations, six reverted to their original fishless status, one is an experimental greenback population, and one is a recent greenback restoration population whose status is currently unknown. Status through 1999:

Class III Lakes	**1999 Status**
Chasm	- Fishless
Crystal	- Experimental greenback population, status unknown
Dream lake	- 1996 greenback restoration project, status unknown
Emerald Lake	- Fishless
Glass Lake	- Reproducing cutthroat and brook trout population
Lake Haiyaha	- Reproducing cutthroat population
Lake Irene	- Fishless
Lake of Clouds	- Fishless
Little Crystal	- Fishless
Lost Lake	- Reproducing greenback restoration population
Mills Lake	- Reproducing rainbow population
Lake Nokoni	- Fishless

Odessa Lake - Reproducing greenback restoration population
Timber Lake - Reproducing Colorado River cutthroat restoration population
Thunder Lake - Reproducing cutthroat and brook trout population
Ypsilon Lake - Reproducing greenback population

CURRENT MANAGEMENT OBJECTIVES

The current fisheries management objectives for RMNP were established in 1969, when the stocking of all species of nonnative and hybrids of native fish to maintain artificial fish populations was abandoned. Lakes not capable of maintaining reproducing fish populations were allowed to revert to their fishless status, and emphasis was placed on documenting the status of RMNP aquatic resources. Those waters capable of sustaining reproducing fish populations were to be considered for reintroduction of greenback cutthroat trout and Colorado River cutthroat trout.

Although the stocking of these alpine lakes provided recreational opportunities, the fish removed invertebrate life used by other species at high elevations, and increased visitor use of delicate high elevation habitats. Following the end of the stocking program, many colder lakes above an elevation of 3,352 m (11,000 ft) reverted to their original fishless status with abundant aquatic invertebrate populations that supported other species of alpine wildlife.

LAKE AND STREAM SURVEY PROGRAM

To document the change in RMNP aquatic resources that followed the end of the stocking program, and to document the fisheries resources of RMNP, fisheries surveys were conducted from 1970 through 1989. The FOPS-WYO methodology (Colorado State University) for fisheries operations planning, was used for stream and lake surveys within RMNP starting in 1984, Tables 11-15.

Although the RMNP aquatic survey program was intended to document the distribution of all the fish species and the condition of aquatic habitats, the program has led to the discovery of several native fish populations within RMNP, including Hunters Creek, Upper Hutcheson Lake, Middle Hutcheson Lake, Paradise Creek and Columbine Creek. Also, the downstream movement of greenbacks from headwater restoration projects into the Moraine Park area of the Big Thompson River, and into the Fall River below Fan Lake. Since 1989, the program has conducted surveys to monitor fish populations at established trend sites.

STATUS OF RMNP LAKES

Of the 147 lakes within RMNP, about 56 lakes had fish populations maintained by natural reproduction or stocking by 1969. Due to the cold water temperatures of RMNP, non-native fish stocked into some of the higher lakes of RMNP (Inkwell, Nokoni) survived for nearly 20 years, and reached lengths up to 635 mm (25 inches), prior to the lakes reverting to their original fishless status by the mid 1980's.

By 1999, 50 lakes in RMNP were known to have fish populations, but only 45 of these lakes are known to have successful spawning each year. The five lakes with fish populations, but not documented to support reproduction of trout, are greenback experimental projects. Four of these are alpine lakes, Crystal Lake, Loomis Lake, Lake Husted and Lake Louise, contained populations of non-native trout. Pure greenbacks were introduced into these four lakes to determine if native species can maintain themselves in harsh habitats under catch-and-release regulations. The fifth lake, Lily Lake, is a heavily fished roadside artificial lake without stream spawning habitat. This population is used as a native trout educational site and as a research area to document greenback response to heavy angler pressure.

2000 Summary of RMNP Lakes With Fish Populations

Greenback

Upper Hutcheson
Middle Hutcheson
Caddis
Bear
Ouzel
Fern
Odessa
Lawn
Lost
Lower Hutcheson
Sandbeach
Pear
Spruce
Dream
Crystal*
Louise*
Husted*
Loomis*
Lily*
Arrowhead(A-)
Ypsilon(A-)

Colorado River

Nanita
Adams
Timber
Bench
Fifth(A-)
Boundary
Solitude(B)

Unknown Cutthroat

Glass
Little Rock
The Loch
Pettingell
Rock
Ten Lakes
Thunder

Yellowstone Cutthroat

Haiyaha(B)
Haynach(B)

Brook

Black
Box
Fan
Fourth
Glass
Lone Pine
Mirror
Ouzel
Peacock
Poudre
Sky Pond
Sprague
Thunder
Verna

Rainbow

Jewel
Mills

* Experimental population

Presently, two lakes are populated by rainbow trout, 11 dominated by brook trout and 37 RMNP lakes are dominated by cutthroat trout. Three lakes (Thunder, Ouzel and Glass) are populated by both cutthroats and brook trout, with cutthroats currently dominating in these lakes.

Six of the lakes that once supported brook trout (Bear, Fern, Ouzel, Lost, Lawn and Husted) are now greenback restoration projects. Of the 37 lakes dominated by cutthroat trout populations, 19 are pure greenback populations (two historic and 17 restoration sites), and four (two historic and two restoration sites) are pure Colorado River cutthroat trout populations. Of the 50 RMNP lakes with fish populations present in 2000, 27 are populated by "B", or better populations of native salmonids within their native drainages.

Although most of the lakes within RMNP were heavily stocked with Yellowstone cutthroat trout up to the late 1940's, the greenback/Colorado River cutthroat trout phenotype dominates in most RMNP lake populations of cutthroat trout. Both greenbacks and Colorado River cutthroat were probably stocked into these lakes prior to 1915, with the current phenotype of most RMNP lakes reflecting one of these subspecies, or a mixture of the two subspecies, rather than the Yellowstone cutthroat trout phenotype.

RMNP AQUATIC RESOURCES DATABASE

Existing data on RMNP waters was entered into a Dbase III file in 1987, updated in 1994 and updated again using Lotus Approach in 1999. Summary of RMNP waters by water, hectares/kilometers, elevation, year of last survey, species present, average length, fish per 100'/net hour and kilogram/hectare can be found in Tables 1 and 2. Aquatic habitats containing greenbacks, Colorado River cutthroat trout, all subspecies of cutthroats, brook trout, brown trout and rainbow trout can be found in Tables 3 through 8.

All RMNP waters are listed from the lowest to highest elevation in Table 9. The highest lake in RMNP with annual fish reproduction is Peacock Pool. Although Peacock Pool is populated with brook trout, the next eight highest reproducing lake fish populations are populations of cutthroat trout.

The aquatic resources database will be used in conjunction with the RMNP Geographic Information System to provide information to any interested party and will be updated annually.

FALL RIVER

On 12 July 1982, the Lawn Lake Dam failed and dramatically changed the Roaring River, and Fall River downstream from the Roaring River Junction.

Prior to the Lawn Lake flood, Fall River had been surveyed on 9 September 1980. To document changes, the sections were resurveyed October 1982, September 1985 and October 1987, Table 10.

The flood reduced fish population near the Roaring River Junction, and washed fish downstream and temporarily increased fish populations just upstream of Cascade Lake immediately following the flood. Stream substrates changed from mainly gravel and cobble near the Roaring River, to mainly shifting sand by October 1982.

Surveys conducted in 1985 found that most of the sand had washed from the Fall River near the junction with the Roaring River. However, sand deposition was very heavy and still moving just upstream from Cascade Lake, with sand filling in most of the hole habitat. Trout populations were returning near the junction with the Roaring River by 1985, but declining in the stream sections just above Cascade Lake, where suckers were the dominate species by 1985.

By 1987, the sample site by the Lawn Lake trailhead was covered by a beaver dam, removing that site from the data set. Sampling of the section just below the Fall River bridge showed that riffle habitat near the Fall River bridge was returning to normal, but holes were still not as deep as prior to the flood. Reproduction of brook trout and brown trout had occurred, with brown trout numbers significantly higher, and brook and suckers numbers similiar to pre-flood numbers in this section.

Although there were significant improvements in the Fall River near the Fall River bridge, the section above Cascade Dam showed no improvement. Hole habitat continues to fill in, with moving sand covering the entire stream bottom. Brown trout present in small numbers in 1985, were absent by 1987. Suckers numbers were similar, but biomass less than pre-flood levels. Brook trout numbers in 1987 actually exceeded pre-flood levels, but size and biomass was significantly less in 1987. Brook trout present in this section were mainly small, and represented migrants from other areas with spawning habitat.

By 1998, stream habitat and fish populations above the Fall River bridge were at pre-flood conditions. At the east end of the Fall River Valley silt persists in the stream bed, and fills pre-flood hole and undercut bank habitat. Brown trout dominate the east end of the Fall River Valley, with sucker populations declining after 1987.

SECTION II

ANGLER USE

Angler Fishing at Odessa Lake

RECREATIONAL FISHING PROGRAM

RMNP CREEL SURVEY PROGRAM

RELEASE OF FISH

NATIVE SPECIES ANGLING PROGRAM

RECOMMENDATIONS

[illegible]

[illegible]

RECREATIONAL FISHING PROGRAM

Recreational fishing is allowed within RMNP "when consistent with the restoration and perpetuation of the natural aquatic environment and aquatic life". Rocky Mountain National Park does not issue, or require a special RMNP permit to fish RMNP waters. However, a valid Colorado fishing license is required for all persons over 14 years of age to fish RMNP. Exit interviews of RMNP visitors conducted in the 1970's estimated annual angler use at 50,000 angler days. Exit surveys conducted in 1994 and 1995, indicated fishing was the "main activity" of 3.6% of the visitors surveyed. With park visitation at 3 million people annually, approximately 108,000 visitors currently fish RMNP each year.

Angling is allowed within RMNP for both native and non-native fish species. A number of non-native fish species were established in RMNP through the stocking program that maintain themselves through natural reproduction. Non-native species established within RMNP include, brown trout, brook trout, rainbow trout and Yellowstone cutthroat trout. RMNP anglers are allowed to harvest fish, other than greenback cutthroat trout, with a possession limit of eight fish of which at least six must be brook trout. The other two fish can be a combination of non-greenback cutthroat, rainbow or brown trout and must be 250 mm (10 inches) or more in length. An additional 10 brook trout may be taken if under eight inches each in length. See Appendix 4 for copy of RMNP fishing information and regulations.

Waters with pure populations of native cutthroat trout are limited to catch-and-release fishing only, except Caddis Lake and Lake Nanita which have a limit of two cutthroats per angler per day. Some waters are closed while restoration efforts are being completed.

CREEL SURVEY PROGRAM

A creel survey program has been conducted in RMNP since 1984 to assess angler success, fish population numbers and distribution of species. Information is gathered by FWS technicians, RMNP rangers, fishing guides and volunteers by having anglers fill out creel survey cards. In most cases, anglers are interviewed away from the waters, with the anglers identifying the species and judging the sizes of fish caught. However, all anglers do not identify fish species correctly, with anglers occasionally reporting species that are not known to be present within the drainage that they are fishing. Despite this problem, the creel survey program provides valuable information on angler use and fish populations within RMNP.

Angler Success. Based upon data collected by the RMNP creel survey program, RMNP anglers caught a yearly average of 1.13 to 3.18 fish per angler hour, with individual waters ranging from 0.0 to 22.0 fish per hour on the east side of RMNP from 1984 through 1999. On the west side of RMNP anglers reported catching a yearly average of 0.88 to 25.0 fish per angler hour, with individual waters ranging from 0.0 to 36.0 fish per hour from 1984 through 1999. For information on specific waters see tables 16 through 45.

The up and down fluctuations in the average catch rate from year to year within the South Platte drainage (east side) and the Colorado River drainage (west side) has mirrored each other from 1989 to 1998. For both drainages the highest catch rates have occurred in 1992 (excluding west side data from 1996 were only two anglers, fishing for a total of one hour, were interviewed) and the lowest catch rates have occurred in 1997 (Figure 1, page 27). This mirror affect could be the result of fluctuations in the amount of water present from year to year, and increased angler use.

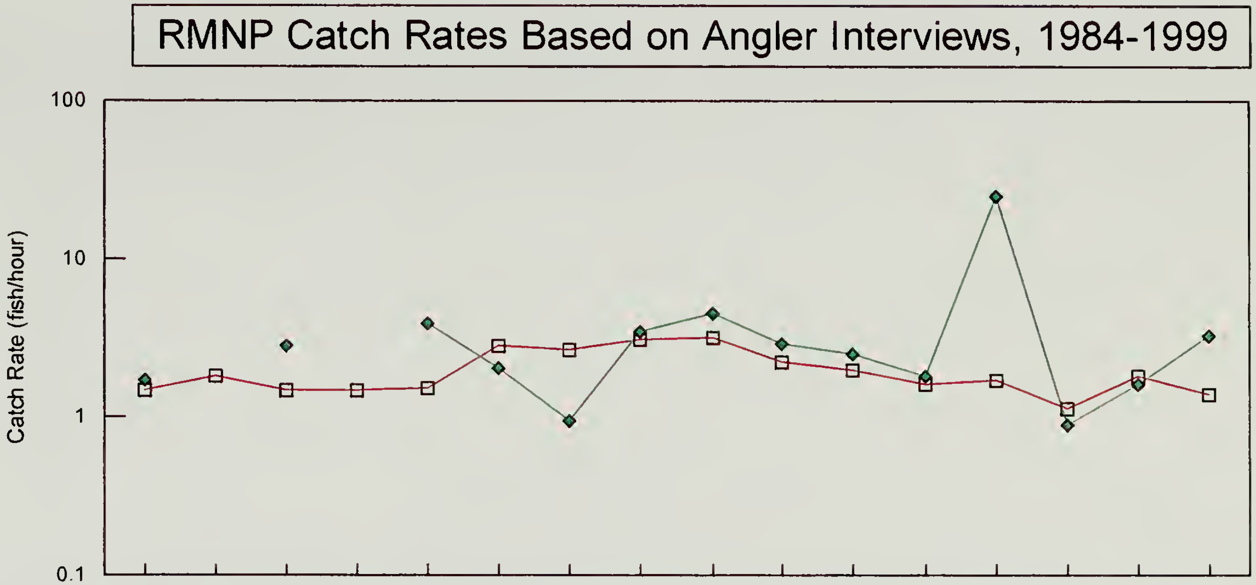
In 1996, 1997, 1998 and 1999 creel data collected from Lily Lake made up a large portion of the total data collected from the east side of RMNP. This is due to the large number of anglers which fish at Lily Lake and to the large amount of data collected by Trout Unlimited volunteers conducting visitor use surveys in 1997,1998 and 1999 (see Special Studies and Projects section, Page 11). Data collected from Lily Lake consisted of 34% of the anglers and 48% of the hours in 1996, 72% of the anglers and 82% of the hours in 1997, 32% of the anglers and 29% of the hours in 1998 and 53.9% of the anglers and 51.8% of the hours in 1999 for the east side of RMNP. Due to the heavy fishing pressure and lack of reproduction, Lily Lake has a lower catch rate than most other areas of the park. If data from Lily Lake were excluded the catch rates for the east side of RMNP would be 2.68 fish per hour for 1996, 2.64 fish per hour for 1997, 2.35 fish per hour for 1998 and 2.17 fish per hour for 1999.

In the South Platte River drainage (east side), brook trout represented the majority of fish caught by anglers from 1984 to 1992. Since 1995, cutthroat trout have represented the majority of fish caught (Figure 2, page 28). The percentage of cutthroat trout reported caught by anglers on the east side of RMNP rose steadily from 1991 to 1998 when it peaked at 77.07%. This is due to the number of waters, 14, that have opened to catch-and-release angling for greenback cutthroat trout since 1990. In 1999 the percentage of cutthroat trout reported caught by anglers decreased. This is due to more information collected from non-cutthroat trout waters than previous years. Another factor possibly affecting the decline in the percentage of brook trout being caught is the decline in the number of brook trout present in some of the lower elevation areas which are most accessible to anglers, such as the Big Thompson River. Electrofishing surveys conducted in Moraine Park, one of the most heavily fished areas of RMNP, have shown an increase in the number of brown trout and a decrease in the number of brook trout present. Average brook trout catch rates have also declined on the Big Thompson River since 1992.

In the Colorado River drainage (west side), brook trout have represented the majority of fish caught by RMNP anglers since the inception of the creel survey program in 1984 until 1998, with the exception of 1996 when only two anglers were interviewed (Figure 3, page 29). In 1999 cutthroat trout represented the majority of fish caught largely due to the large number of fish reported caught at Lake Nanita.

RELEASE OF FISH

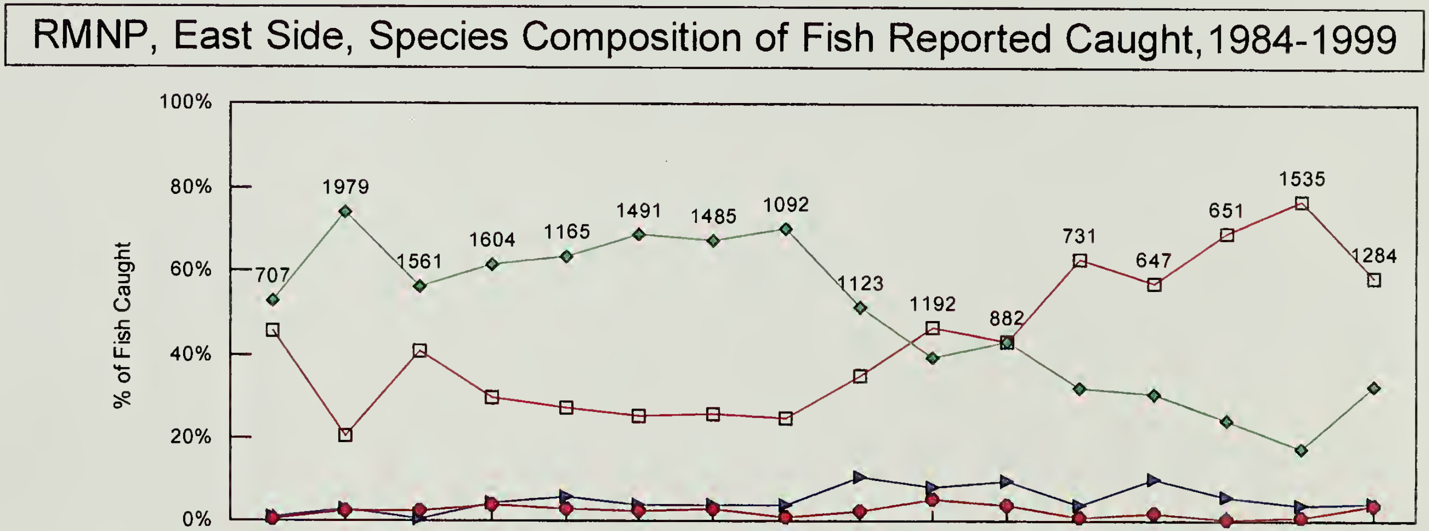
Data collected by the RMNP creel survey program has shown a steady increase in the percentage of fish released by anglers since anglers were first asked to report release of fish in 1985. Both the east and west sides had release rates over 95% for all fish species caught by anglers interviewed in 1999 (Figure 4, page 30). On the east side of the park the release rate has been above 90% since 1992.



Year	1984	1985*	1986	1987*	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
□ East Side	1.49	1.81	1.48	1.47	1.5	2.84	2.62	3.02	3.18	2.25	1.96	1.61	1.7	1.13	1.82	1.39
◆ West Side	1.72		2.8		3.89	2.02	0.95	3.41	4.44	2.87	2.51	1.82	25	0.88	1.61	3.28

* No creel survey data was collected for the west side of RMNP in 1985 and 1987.

Figure 1

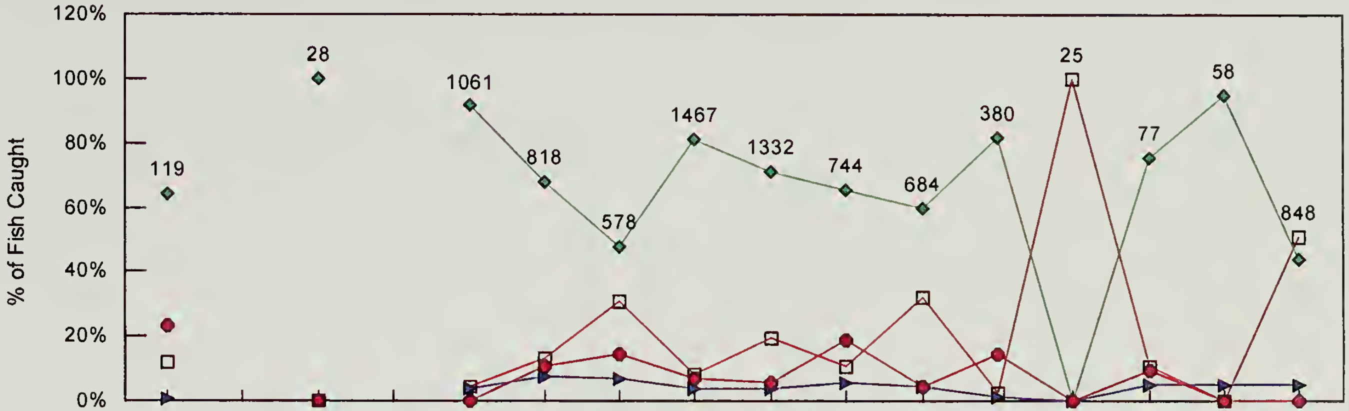


Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
□ % Cutthroat Trout	45.69%	20.36%	40.55%	29.49%	27.30%	25.22%	25.66%	24.73%	34.82%	46.56%	43.08%	63.20%	57.03%	69.12%	77.07%	58.72%
◆ % Brook Trout	52.76%	73.93%	56.18%	61.66%	63.52%	68.61%	67.41%	70.33%	51.56%	39.18%	43.08%	32.01%	30.76%	24.27%	17.39%	32.63%
▶ % Brown Trout	1.13%	2.88%	0.83%	4.61%	5.92%	3.82%	3.84%	3.94%	11.04%	8.56%	9.64%	3.83%	10.36%	6.14%	4.17%	4.36%
● % Rainbow Trout	0.42%	2.83%	2.43%	4.24%	3.26%	2.35%	3.10%	1.01%	2.58%	5.70%	4.20%	0.96%	1.85%	0.46%	1.37%	4.28%

Numbers above data points are the number of fish reported caught by anglers interviewed for that year

Figure 2

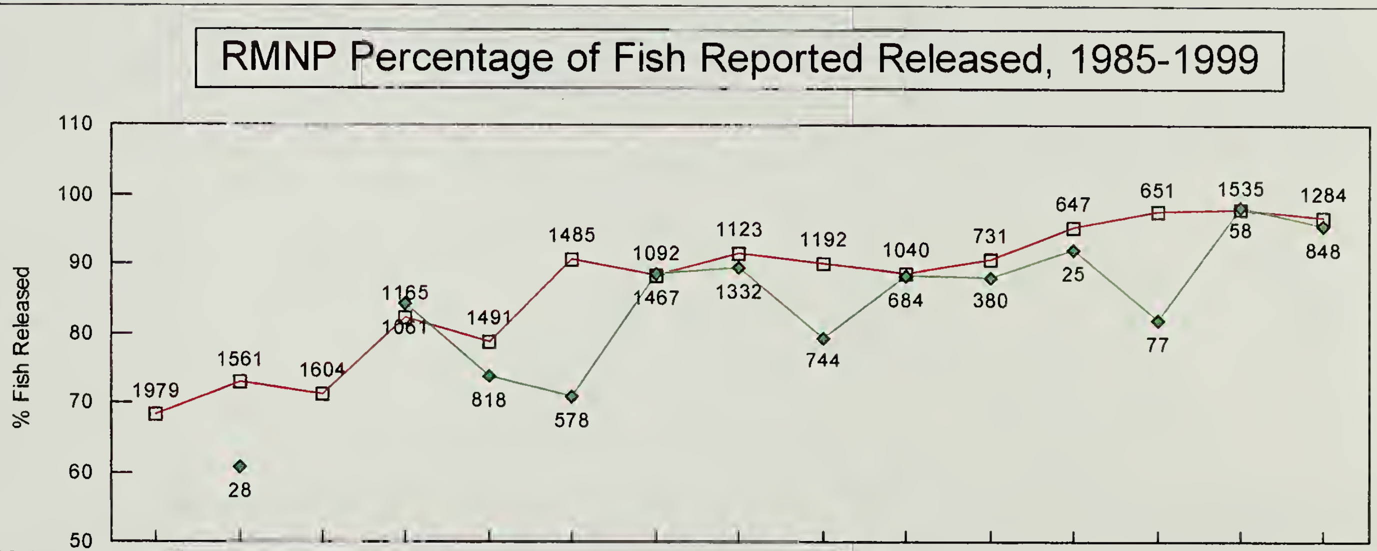
RMNP, West Side, Species Composition of Fish Reported Caught, 1984-1999



Year	1984	1985*	1986	1987*	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
□ % Cutthroat Trout	11.76%		0.00%		4.62%	13.45%	30.80%	8.11%	19.52%	10.35%	32.02%	2.37%	100.00%	10.39%	0.00%	50.71%
◆ % Brook Trout	63.87%		100.00%		91.52%	68.09%	47.75%	81.46%	71.32%	65.19%	59.50%	82.11%	0.00%	75.32%	94.83%	44.22%
▶ % Brown Trout	0.84%		0.00%		3.68%	7.58%	7.09%	3.54%	3.45%	5.65%	4.24%	1.05%	0.00%	5.19%	5.17%	5.07%
● % Rainbow Trout	23.53%		0.00%		0.19%	10.88%	14.36%	6.88%	5.71%	18.82%	4.24%	14.47%	0.00%	9.09%	0.00%	0.00%

Numbers above data points are the number of fish reported caught by anglers interviewed for that year
* No creel data was collected for the west side of the park in 1985 and 1987

Figure 3



RMNP Percentage of Fish Reported Released, 1985-1999

Year	1985*	1986	1987*	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
🟥 East Side	68.22	72.84	71.2	82.32	78.67	90.64	88.19	91.63	90.1	88.75	90.7	95.36	97.54	97.79	96.81
◆ West Side		60.71		84.17	73.72	70.93	88.48	89.49	79.44	88.3	88.16	92	81.82	98.28	95.52

Numbers above and below data points are the number of fish reported caught by anglers interviewed for that year

* No creel data collected for the west side of RMNP in 1985 and 1987

Figure 4

Although some RMNP waters are designated as catch-and-release only areas, anglers also appear to be keeping less than their limit of legally harvestable trout species caught within RMNP waters. RMNP anglers may keep a cumulative total of two rainbow, brown and/or non-greenback cutthroat trout over 10 inches in length and up to 18 brook trout per day. Anglers reported releasing 94.6 % of the fish which are legal to harvest on the east side of RMNP, and 95.4 % of legally harvestable fish on the west side in 1999. Along the heavily fished sections of the Big Thompson River through Moraine Park and the Colorado River anglers reported releasing 100% of the fish they caught in 1997 and 1998. Eighteen anglers released 108 fish in 1998, and 3 anglers released 63 fish in 1997 from the Big Thompson River. Fifty-seven fish were released by 8 anglers in 1998, and 36 fish were released by 10 anglers in 1997 from the Colorado River. In 1999, 96.2% of the fish caught in the Big Thompson River were released and 97.4% of the fish caught in the Colorado River were released.

NATIVE SPECIES ANGLING PROGRAM

Greenback Cutthroat Trout. Currently, 30 sites in RMNP are open to catch and release angling for greenback cutthroat trout, with 14 of these areas opening since 1990. Catch rates for greenback waters ranged from 1 to 21 greenbacks per angler hour in 1998.

Greenback waters opened since 1990:

Water	Year Opened	Average Catch Rate (Fish/Hour)	# Years Data Collected
Crystal Lake	1990	1.03	3
Lost Lake	1990	1.95	4
NF Big Thompson River Above Lost Falls	1990	3.22	1
Lake Louise	1990	12.0	1
Roaring River	1991	3.59	6
Lower Hutcheson Lake	1991	0.88	3
Pear Lake	1991	3.97	4
Sandbeach Lake	1991	0.39	4
Cony Creek	1991	5.05	5
Lily Lake*	1992	0.80	8
Spruce Lake	1993	3.97	3
Loomis Lake	1993	18.2	2
Lake Husted	1995	14.9	2
Dream Lake	1999	2.50	1

*Lily Lake is not a restoration project. It contained only rainbow trout prior to 1990 when it was stocked with greenback fingerlings. The first year greenbacks showed up in the creel survey was 1992. Catch rate is for greenbacks only. No rainbow trout have shown up in the creel survey since 1992.

Of all the greenback restoration areas where there are multiple years of creel survey data before and after restoration, only one, Sandbeach Lake, has lower catch rates after its restoration. Prior to the restoration of Sandbeach Lake the average catch rate was 0.81 fish/angler hour. After the restoration catch rates have averaged 0.39 greenbacks/angler hour. The catch rates at Crystal Lake, Lost Lake, Ouzel Lake, Fern Lake, Odessa Lake, Lawn Lake, the Roaring River, Pear Lake, Cony Creek and Spruce Lake have all increased since their restoration to greenbacks. This is in spite of the fact that some of these areas were stocked in years when creel survey data was collected. Some of these increases have been significant. Spruce Lake catch rates have increased from 0.58 fish/angler hour prior to its restoration to 3.97 greenbacks/angler after restoration. Catch rates at Cony Creek (1.67 vs 5.05), Pear Lake (0.73 vs 3.97) and Fern Lake (0.74 vs 3.02) also have increased significantly. Part of this increase at Lawn, Pear and Lost Lakes is due to removal of dams, and increased spawning habitat after dam removal.

Colorado River Cutthroat Trout. Currently five waters, Timber Lake and Creek, Adams Lake, Paradise Creek and Fifth Lake, containing Colorado River cutthroat trout are open for catch-and-release angling.

No angler data has been collected for Fifth Lake. Limited angler data is available for Paradise Creek and Adams Lake. One angler, who fished for 20 minutes at Adams Lake was interviewed in 1993 and did not catch any fish. Anglers fishing at Paradise Creek reported catching two Colorado River cutthroats per hour in 1999, four Colorado River cutthroats per hour in 1992, and 5.6 Colorado River cutthroats per hour in 1975.

Timber Lake and Creek opened to angling in 1987. Since then anglers have reported catching 1.24 fish per hour, from four years of data, in the lake and 2.94 fish per hour, from three years of data, in the creek. The catch rates for Timber Creek were highest in 1989 when 6.57 fish per hour were caught. They decreased to 1 fish per hour caught in 1994, and no fish were caught in one hour of fishing in 1997. Conversely, the catch rate at Timber Lake was highest in 1992, the year the latest creel survey data was collected, with 3.8 fish per hour caught. Prior to 1992 catch rates were less than one fish per hour.

Lake Nanita is open to angling for pure Colorado River cutthroat trout with a two fish limit. Since 1984 (start of the current creel survey program), creel data has been collected from Lake Nanita in ten out of 14 years. Yearly catch rates have ranged from 0.75 to 5.6 fish per hour with an average of 2.30 fish per hour over that time. Creel data was also collected in 1975 at Lake Nanita with 0.8 fish per hour being caught.

Willow Creek, Onahu Creek, Boundary Lake and the upper Colorado River contain small populations of Colorado River cutthroat trout. They are open to angling with a two fish limit. These areas are remote and/or lightly visited and receive very little fishing pressure.

RECOMMENDATIONS

In the future more creel survey information should be gathered from the west side of RMNP, especially waters containing Colorado River cutthroat trout. An effort should also be made to collect data from Dream Lake, which opened to angling in 1999, to assess angler success at this greenback restoration site.

SECTION III

MANAGEMENT OF NATIVE FISH SPECIES

BACKGROUND ON GREENBACK CUTTHROAT TROUT

GREENBACK CUTTHROAT TROUT PURE HISTORIC POPULATIONS

GREENBACK CUTTHROAT TROUT STOCKING PROGRAM

GREENBACK CUTTHROAT TROUT RESTORATION PROJECTS

GREENBACK CUTTHROAT TROUT EXPERIMENTAL INTRODUCTIONS

OTHER GREENBACK CUTTHROAT TROUT POPULATIONS

BACKGROUND ON COLORADO RIVER CUTTHROAT TROUT

COLORADO RIVER CUTTHROAT TROUT PURE HISTORIC POPULATIONS

COLORADO RIVER CUTTHROAT TROUT RESTORATION PROJECTS

OTHER COLORADO RIVER CUTTHROAT TROUT POPULATIONS

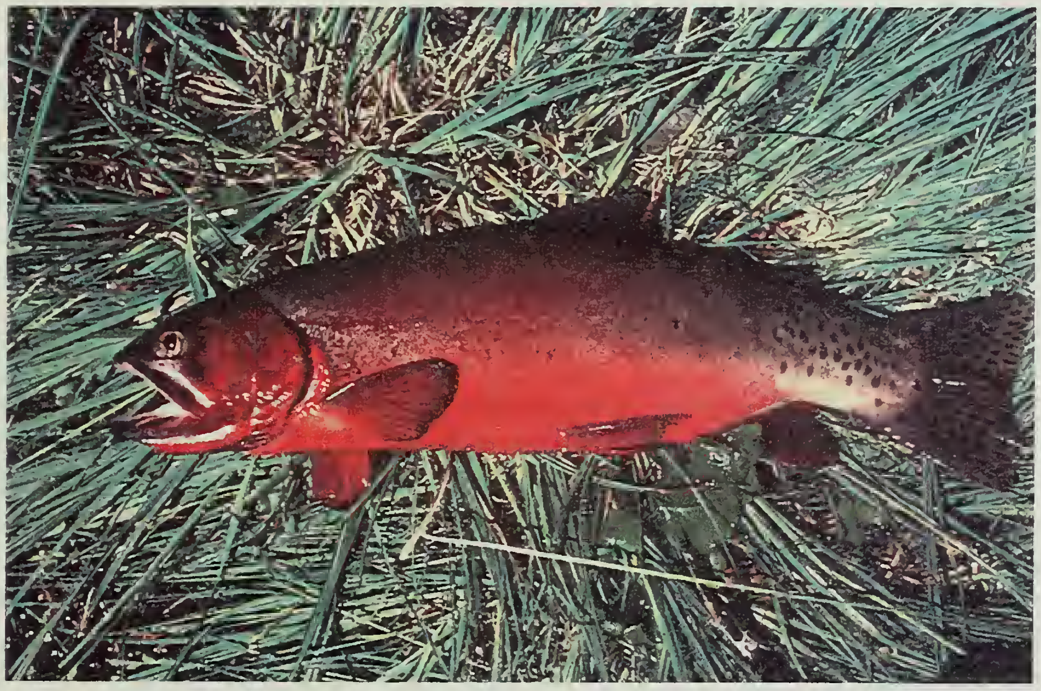
OTHER NATIVE FISH SPECIES

BACKGROUND ON GREENBACK CUTTHROAT TROUT

The greenback cutthroat trout (*Oncorhynchus clarki stomias*) was one of the three Colorado native salmonids present east of the Continental Divide prior to the arrival of European settlers, and occupied the trout habitat of the headwaters of the Arkansas and South Platte River drainages. Attempts to culture greenbacks at the Leadville National Fish Hatchery from 1889 to near the turn of the century failed. Hatcheries turned to stocking of non-native fish species such as brook and rainbow trout which were better suited for hatchery rearing (USFWS 1998).

Activities related to 19th century development in Colorado lead to overharvest, pollution, siltation and dewatering of streams which had negative influences on the greenbacks. However, the introduction of non-native trout species which hybridized and outcompeted the native species had the greatest impact. All these factors resulted in a drastic decline of the greenback's abundance and distribution.

Although, some considered the species extinct by 1930, about 2,000 greenbacks, that conformed to the meristics of the type specimens, in two small historic populations, were known to remain within Colorado when the species was Federally listed as Endangered in 1973. These two historic populations, Como Creek and the South Fork of the Cache la Poudre River, consisted of about four miles of stream habitat. Part of the Poudre River population is within RMNP. The greenback was downlisted in 1977 to threatened to help facilitate recovery efforts.



Male Greenback Cutthroat Trout From Bear Lake

Boundary changes to RMNP resulted in more of the Poudre population to be included within RMNP by 1981, and surveys of RMNP lakes and streams led to the discovery of four previously unknown historic populations (Hunters Creek, Upper Hutcheson Lake, Middle Hutcheson Lake and Hague Creek) that are totally within RMNP. Presently, of the seven known historic populations of pure South Platte River greenbacks known to remain, five exist in part or entirely within RMNP.

By combining advances in the removal of non-native fishes from historic habitats with the ability to stock large numbers of hatchery reared greenback fry for multiple years, a total of 12 renovation projects have been completed within RMNP through 1999. Currently there are 34 areas within RMNP which contain good representatives of greenbacks.

GREENBACK CUTTHROAT TROUT PURE HISTORIC POPULATIONS

South Fork Cache La Poudre River

The majority of this population exists outside of RMNP, with survey work and egg collection operations conducted on this population by the Colorado Division of Wildlife (CDOW), RMNP and FWS. This population of historic greenbacks was estimated at 640 fish (Culver *pers. comm.* 1984). Surveys in the late 1980's by CDOW indicated poor survival of young fish, with few year classes present. Several of the good pools that provided the best habitat in this harsh environment were washed out in 1985, but most reformed by July 1989. This population is currently being managed as a broodstock refugium.

Egg and Milt Collection

Eggs were collected from this population on 16 July 1984 and 5 July 1985, in an attempt to establish a captive broodstock. Fry produced from eggs collected in 1984 and 1985 failed to accept feed at the Saratoga NFH, and none survived to maturity.

To increase the genetic diversity of the Bozeman Como Creek broodstock, milt was collected from these fish on 30 June 1986. Due to high water flows, 3.0 hours of shocking collected only six ripe greenbacks 140 mm to 254 mm in length, of which two were ripe males. Three females collected in 1986 were one to two weeks from spawning.

Another attempt was made to collect eggs from this population on 12 July 1989, as part of the new CDOW South Platte greenback broodstock. Although 1989 was a dry year, the Poudre River greenbacks were just starting to spawn by 12 July, with an afternoon water temperature of 7° C. Twelve fish were captured, over a range of 180 mm to 320 mm in length, but only one of five females was in condition to release eggs. Although eggs were collected from one female, the eggs produced no fish at the CDOW hatchery. The other four females that were not ready to release their eggs on 12 July, were held in a cage in hopes of spawning them at a later date. However, all of these fish had released their eggs when checked on 20 July.

Eggs were collected on 7 July 1992 from two females and fertilized with two males. One hundred fifty eggs were taken to the CDOW Experimental Hatchery in Fort Collins. Of these eggs 54 survived and were stocked into Bear Lake in 1993. Eggs were also collected in 1995, hatched at the CDOW Experimental Hatchery, and stocked into Zimmerman Reservoir in 1996.

From observations since 1984, spawning of the Poudre River greenbacks occurs from early to mid-July, and leaves little time for the hatching of eggs and their development prior to the decline of water temperatures in September. However, from the hatchery work completed in 1984 and 1985, it appears that the eggs from this population may develop faster than other trout. Additional investigation into egg development of this population needs to be completed, since this trait could be very beneficial in developing reproducing greeenback populations at high elevations.

Population Studies

Biomass estimates reported by the CDOW from 1986 through 1988, indicated a density of 25.8 kg/ha. Overall, this population is comprised of older fish, with the CDOW reporting that the population has declined from 14 fish/100m in 1986 to 5 fish/100m in 1989. Overall, the cold water temperature of this location, and late spawning date, will always limit this population. However, the CDOW also reported signs of fishing activity on this stream late in 1989.

Habitat improvement structures were placed in the Forest Service portion of this population in the 1990's. A population survey was completed by the CDOW on 5 August 1998, with an estimate of 30.08 kg/ha and 173 fish/ha. Greenbacks averaged 250 mm and 175 g, over a range of 150 mm to 300 mm

In 1999, Dr. Michael K. Young of the USDA Forest Service-Rocky Mountain Research Station conducted a population estimate on the entire South Fork Poudre greenback population. He estimated that there are 170 greenbacks, averaging 230mm, with a 95% confidence interval of 98 fish, in 1640 m of habitat where greenbacks were allopatric. This represents a significant decrease from Culver's 1984 estimate of 640 fish.

Hunters Creek

This historic population was discovered in June 1985 within Rocky Mountain National Park, and was confirmed as Type A greenbacks by Dr. Robert Behnke (1985) of Colorado State University:

"The specimens are consistently uniform in spotting pattern and phenotypic appearance. The strikingly pronounced large spots on the body and red-pink spawning coloration of males indicate the sample was drawn from a pure population of S. c. stomias. In all of the diagnostic characters, the Hunter's Creek specimens are intermediate between the Como Creek population and Little South Poudre population. All specimens have nine pelvic fin rays (typically 10 in rainbow trout and hybrids). The uniform spotting pattern, high scale counts, low caecal counts, well developed basibranchial teeth, and number of pelvic fin rays, all agree that no hereditary material from rainbow trout occurs in the Hunter's Creek population. The first gill arch of the specimens possess posterior gillrakers, a character typical of S. c. stomias but absent in rainbow trout."

Collecting Eggs From Greenbacks at Hunters Creek

The Hunters Creek greenback population inhabits about 2 km of stream within the North St. Vrain drainage, above a steep canyon wall northwest of the Wild Basin Ranger Station, and below Lyric Falls. Hunters Creek is closed to all fishing and is managed as a broodstock refugium.

Egg and Milt Collection

From 1986 and through 1988, milt from Hunters Creek greenback cutthroat trout was collected in June to improve the genetic diversity of the Bozeman captive broodstock. To start the new CDOW South Platte greenback broodstock, eggs were collected from the greenbacks in Hunters Creek on 23 June 1989. Most of the females collected were running eggs, with 3,688 eggs collected on 23 June.

For future broodstock 1,185 eggs were collected and shipped to the CDOW Experimental Fish Hatchery in 1992. On 1 July 1993, 1,600 eggs were collected and on 11 July and 19 July 1995 a total of 3,600 eggs were collected and transported to the CDOW Experimental Hatchery in Fort Collins. Two thousand eggs were also collected in 1997 and sent to the CDOW hatchery in Pueblo. It is expected that eggs will be collected from Hunters Creek in 2000.

During spawning in 1997, 14 females were handled at the Sandbeach trail crossing and 5 were handled at the Beaver Mill campsite. The Sandbeach greenbacks averaged 181 mm over a size range of 147 mm to 201 mm. Most of these females were ripe, with one being spent and the smallest was immature. The Beaver Mill females averaged 205 mm with a size range of 180 mm to 220 mm. Two of these fish were ripe, 2 were spent and the last was half spent. There were twice as many males than females at the Sandbeach site and 18 males were used at the Beaver Mill site. Overall the spawning run was coming to an end. Fish were in great condition.

Population Studies

A two-pass population estimate was conducted above the Sandbeach Lake trail crossing and near the Beaver Mill campsite on Hunters Creek in September 1988. Results indicate a greenback population of 8 fish/100' and 51.5 kg/ha near the Beaver Mill campsite and 11 fish/100' and 97.4 kg/ha above the Sandbeach Lake trail crossing. Although people are removing the "closed to fishing" signs, the Hunters Creek greenback population is excellent with 98 greenbacks over 120 mm handled for spawning in 1989. Average length of greenbacks spawned in June 1989, was 194 mm, over a range of 121 mm to 280 mm.

Current Population Status

In 1999, an electrofishing survey was conducted to obtain a population estimate for the entire Hunters Creek population. Using methodology developed by Dr. Michael K. Young of the USDA Forest Service Rocky Mountain Research Station it was estimated that there are 670 greenbacks present in Hunters Creek with a 95% confidence interval of plus or minus 239 fish. This estimate correlates to 11.2 fish/100'. The average length of adult fish sampled was 195.3 mm with all fish over a size range of 66mm to 312 mm.

Angler Use

Hunters Creek is currently closed to angling.

Summary of Creel Survey Data, Hunters Creek, 1958-1986

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	1.14	no data	416.7	Cutthroat, rainbow, brook
1960	1.00	1	3.0	Rainbow, Brook
1963	0.50	3	12.0	Cutthroat
1964	0.80	2	5.0	Cutthroat
1969	1.76	5	17.0	Cutthroat
1975	1.67	2	12.0	Brook
1986	Closed to angling			

Upper and Middle Hutcheson Lakes

Following the discovery of the Hunters Creek population of greenbacks in 1985, other populations of cutthroat trout within the North St. Vrain drainage were examined. The Hutcheson Lakes were known to contain a phenotypic population of greenbacks, but were considered to be hybridized due to past stocking of the lakes in the drainage. However, fish samples collected in 1986 from the Upper Hutcheson Lake (Behnke 1986), and in 1987 from Middle Hutcheson Lake (Behnke 1987) were determined to represent Type A greenbacks.

Summary of Character Analysis, Type A Greenbacks, South Platte River Drainage, CO (Behnke 1986):

	Gillrakers	Pyloric caeca	Scales above L.L. and in lat. ser.	Basibranchial teeth
U. Hutcheson L.	8-25	29-48	48-57 (52.8)	3-18
RMNP N=27	(21.3)	(36.6)	194-214 (206.2)	(9.4)
Hunters Creek	18-22	27-35	48-57 (51.6)	7-12
RMNP N=7	(19.9)	(31.6)	187-212 (195.7)	(8.9)
Como Creek	17-21	24-42	46-53 (48.4)	1/18 no teeth
FS N=18	(19.0)	(29.4)	174-205 (189.3)	17w/3-12(6.0)

Upper Hutcheson Lake

So. Fk. Poudre	19-23	27-50	53-60 (56.7)	2-17
RMNP/FS N=18	(21.3)	(35.2)	205-236 (216.5)	(11.1)

Egg and Milt Collections

Eggs were collected from Upper Hutcheson Lake on 5 July 1996 and 10 July 1997. Seven thousand eggs were collected in 1996, and transferred to the CDOW Experimental Hatchery in Fort Collins. Ten thousand one hundred eggs were collected in 1997, with these eggs sent to the CDOW hatchery in Pueblo. In addition to the egg collection in 1997, 190 adult and 5 immature fish were moved to Dream Lake by helicopter.

Current Population Status

Middle Hutcheson Lake. A gill net survey conducted on 10 August 1998 captured 11.66 greenbacks per hour, the highest catch rate by far since gill net surveys were first conducted in 1981. All fish were in good condition.

Summary of Gill Net Sampling, Middle Hutcheson Lake, 1981-1999

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/30/81*^	Greenback	296.43	216-419	0.43	0.16
08/26/86*~	Greenback	252.00	223-269	0.16	0.03
08/05/87*$^{\#}$	Greenback	312.66	254-345	0.09	0.04
08/10/98$^{\%}$	Greenback	338.14	272-418	11.66	4.55

* Overnight net set
^ Net set at outlet
~ Location of net set unknown
$^{\#}$ 2 nets set, one at inlet, one at outlet
$^{\%}$ Net set at southwest cove at false inlet

Upper Hutcheson Lake. Upper Hutcheson Lake is the third highest lake in RMNP with a reproducing fish population, and contains the largest known population of greenbacks, with 3.38 greenbacks/net hour caught in 1981, 27 greeenbacks/net hour caught in 1986, and 15 greenbacks/net hour caught in 1998.

Summary of Gill Net Sampling, Upper Hutcheson Lake, Outlet Trend Site, 1963-1999

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour

08/16/63	Greenback	no data	203-305	1.50	no data
07/31/81*	Greenback	237.35	178-321	3.38	0.47
07/24/86	Greenback	255.12	205-330	27.00	4.58
07/10/90	Greenback	235.15	163-320	44.00	6.13
08/11/98	Greenback	265.42	211-305	15.00	2.43

* Overnight net set

Angler Use

Middle Hutcheson Lake. Although a gill net survey in 1998 produced the highest catch rate at Middle Hutcheson Lake, creel survey data for 1998 shows anglers had the poorest success of any year in which data was collected. In addition to data shown below, three volunteers assisting in the gill net survey in 1998 caught 1 greenback in a total of 1.5 hours of angling.

Summary of Creel Survey Data, Middle Hutcheson Lake, 1993-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1993^	5.21	5	30.3	Cutthroat
1995	5.80	4	5.0	Cutthroat
1998	1.00	2	5.0	Cutthroat

^ Anglers reported their location as Hutcheson Lakes

Upper Hutcheson Lake. Two anglers interviewed in 1998, who said that they have fished the Hutcheson Lakes yearly for the last ten years, said that the fishing appeared to be down in 1998 from previous years. Creel survey data agrees with this, however catch rates are still the highest among the Hutcheson Lakes chain.

Summary of Creel Survey Data, Upper Hutcheson Lake, 1985-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1985	2.00	2	2.0	Cutthroat
1987	5.18	3	22.0	Cutthroat, rainbow
1988	1.80	2	25.0	Cutthroat
1993^	5.21	5	30.3	Cutthroat
1995	7.56	2	18.0	Cutthroat
1998	4.53	2	30.0	Cutthroat

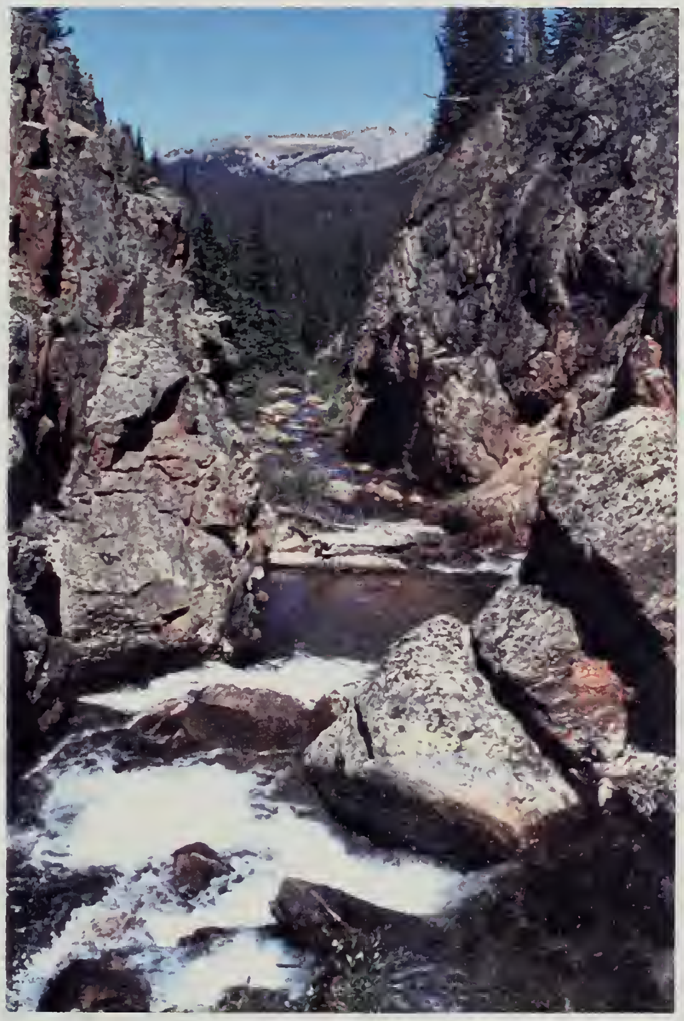
^ Anglers reported their location as Hutcheson Lakes

Hague Creek

The Hague Creek greenback cutthroat trout population is actually two populations. One population is located on Hague Creek above a barrier at 3,148 m (10,657 ft). Currently it is believed that the greenbacks inhabit only one beaver pond above the barrier with no fish observed above this pond. The second population is in a small tributary which drains Hazeline Lake. Greenbacks are found, along with brook trout in a 1,500 foot section of stream from Hague Creek to a small barrier. Above the barrier there are no brook trout with greenbacks extending for about another 320 feet through a steep section of the stream to another barrier at 3,111 m (10,207 ft).

Stocking records show 42,240 "black spotted" eggs were stocked into a lake at the headwaters of Hague Creek, 3,474 m (11,390 ft), in 1940 and 5,000 “black spotted” fry were stocked in lower Hague Creek in 1942.

A survey conducted in 1957 (Bulkley) found no fish above a barrier at 3,294 m (10,800 ft) on upper



Canyon Below Barrier on Upper Hague Creek

Hague Creek, although the area above the falls was examined and fished carefully. Below the falls both cutthroat and brook trout were present with brook trout being exceedingly abundant. All fish were small in size with some emaciated specimens captured. This area would be above the current population of greenbacks in upper Hague Creek and currently no brook trout have been caught or observed in with the greenbacks.

A survey of the two populations was conducted in the 1980's. The upper Hague Creek population were present only in a small area above the barrier with only large fish caught by angling (Don Proebstel, *pers. comm.*). The Hazeline tributary population started at the junction with Hague Creek. No brook trout were captured by angling through the section containing the greenbacks.

Current Population Status

Upper Hague Creek. Visual and hook-and-line surveys conducted in 1998 and 1999 found all cutthroats confined to one beaver pond with one exception. Two fish, 375 mm and 244 mm, were caught out of the pond with several other fish in three to four age classes also observed. Another fish, 242 mm, was caught below the barrier in a dense brook trout population. Tissue samples were collected from these three fish and were taken to Don Proebstel for genetic analysis.

Hazeline Tributary. In 1998, tissue samples from 15 greenbacks averaging 209 mm were collected by angling and taken to Don Proebstel for genetic analysis. This collection was over a two day period. On the first day only greenbacks were caught, while on the second day brook trout along with greenbacks were caught in the same section that was fished the day before.

In an effort to conserve this population a brook trout removal project was conducted in 1999. The stream was divided into six 300 foot sections starting at Hague Creek. The first five sections were sampled using two-pass electrofishing with all brook trout being removed. No brook trout were found in the sixth section, so only a single pass was used on this section. Greenbacks were found in each section with only one greenback sampled in each of the first two sections and with an increasing number sampled in each successive section as the survey moved upstream, see following table. Greenbacks averaged 209 mm and brook trout averaged 184 mm with only brook trout collected in the first section measured. A total of 198 brook trout weighing 12.9 kg were removed from 1,500 feet of stream.

Section Number	Number of Greenbacks	Number of BKT Removed
1	1	38
2	1	51
3	4	59
4	8	39
5	10	11
6	15	0
Total	39	198

Taxonomic analysis By Don Proebstel determined that the Hazeline population were B+ cutthroats from multiple sources with some Yellowstone cutthroat trout influence. The upper Hague Creek population were determined to be A- cutthroats from multiple sources. Due to the small sample size further collection samples will be done in 2000. Locating additional areas that contain fish upstream of the upper Hague Creek population will also be attempted in 2000.

Angler Use

No creel survey data is known to have been collected from upper Hague Creek. However, anglers have reported catching cutthroat trout in Hague Creek, exactly where is unknown, in 1961, 1970, 1971, 1975, 1984, 1988, 1990 and 1991. In 1963 and 1964 anglers reported catching cutthroats at the Hague Creek/Cache la Poudre River junction. This indicates that cutthroats were once common within the Hague Creek drainage.

During collection of tissue samples in 1998, two anglers caught 15 cutthroats in a total of approximately seven hour, including the time to process tissue samples, in the Hazeline tributary.

The upper Hague Creek population was fished for 3 hours with no greenbacks caught in 1998. The majority of the time, 2 hours, was spent trying to catch one large fish. The rest of the time was spent fishing the creek above the beaver pond. During tissue collection in 1999 the upper Hague Creek population was fished for about two hours with two greenbacks caught in that time. A short canyon below the barrier was also sampled by hook-and-line in 1999. In 1.25 hours of fishing 30 brook trout and 1 greenback were caught in this area.

GREENBACK CUTTHROAT TROUT STOCKING PROGRAM

In 1977, 64 greenbacks from Como Creek were transferred to the FWS Bozeman Fish Technology Center in Bozeman, Montana to create a South Platte captive broodstock program. Despite previous failures to rear greenbacks in captivity at the Leadville NFH in 1889 and 1957 (USFWS 1998), the 1977 experiment proved to be a great success, with over 160,000 greenback fry produced for greenback restoration projects through 1988.

In an effort to prevent genetic selection at the hatchery, milt from Como Creek, Hidden Valley Creek, Hunters Creek and the South Fork of Cache la Poudre River was shipped to Bozeman starting in 1982.

An attempt was also made to establish a Arkansas River greenback broodstock at the Saratoga NFH in Saratoga, WY in 1984 and 1985. Eggs collected in 1984 did not survive, but 47% of the eggs collected in 1985 survived to swim up. None of these fish would accept feed and all died.

Due to lack of funding, shipping problems caused by distance and disease classifications, and problems in obtaining fish control permits, the Bozeman broodstock program was abandoned in 1993 (Rosenlund et al. 1994).

Anticipating that the FWS program would be abandoned, a new South Platte greenback broodstock was initiated at the CDOW Experimental Hatchery at Fort Collins, Colorado in 1989. During 1989, a total of 5,419 eggs were collected from Bear Lake (RMNP), Como Creek (FS), Hunters Creek (RMNP) and the South Fork of the Cache la Poudre River (RMNP, FS). In 1990, about 200 greenback eggs were collected from Upper Hutcheson Lake (RMNP) through a cooperative effort between RMNP, CDOW and FWS.

Eggs were collected from the 1989 year class, except the Poudre River eggs which did not survive, in 1991and 1992. The entire 1989 year class was lost in 1992 due to fungus, so another 851 eggs were collected from Hunters Creek for a future broodstock.

Bacterial kidney disease was found in the hatchery in 1993 and following disinfection of the hatchery, 1,600 eggs were once again collected from Hunters Creek for use in future South Platte drainage greenback broodstock programs. However, in 1996 the Experimental Fish Hatchery tested positive for whirling disease.

Fertilized eggs collected in 1997, the last year eggs were collected from RMNP, were reared at the CDOW hatchery in Pueblo, Colorado. At this time the future of a South Platte greenback broodstock is uncertain.

GREENBACK CUTTHROAT TROUT RESTORATION PROJECTS

Caddis Lake

Caddis Lake is the lowest elevation lake, 3290 m (10,794 ft), in a string of three lakes known as the Fay Lakes which also includes Fay Lake, 3360 m (11,024 ft), and Faylene Lake, 3420 m (11,221 ft). The Fay Lakes are located along an unnamed tributary of Ypsilon Creek. Caddis Lake itself is a small, 0.98 ha, shallow, 0.76 m maximum depth, lake. However, good fish habitat exists in the inlet stream. Stocking records show plants of "black spotted" fry into Lake Fay in 1942, 1943 and 1950.

In the late 1950's the FWS rediscovered what was thought to represent a genetically pure population of greenback cutthroat trout in the Forest Canyon section of the Big Thompson River in RMNP (Bulkley 1957). Surveys were conducted in 1957 in RMNP to assess habitat for potential reintroductions of greenbacks. Based on these surveys it was determined that the Fay Lakes drainage was the most suitable location in RMNP in spite of the fact that no fish were found to be present in

Bright Coloration of Male Caddis Lake Greenback

Fay or Faylene Lakes.

On 9 September 1958 the Fay Lakes drainage was chemically treated with rotenone to a 60 foot barrier below Caddis Lake (Bulkley 1959). One hundred thirteen fish, averaging 164.3 mm over a size range of 88 mm to 367 mm, were recovered from Caddis Lake and its inlet and outlet stream. In addition numerous dead fry, 30 mm to 35 mm, were also observed in the inlet, outlet and along the shore line. These fish appeared to be Yellowstone cutthroats. No fish were recovered from Fay or Faylene Lakes.

In 1959 fish were removed from Forest Canyon and taken to the Fall River hatchery and held until 6 August when 97 fish were stocked by helicopter into Fay Lake (Cope 1959). Another 112 fish were stocked on 4 September. The size range of these fish was 114 mm to 254 mm. No mortality was observed in either stocking.

Inspection of Fay Lake in the summer of 1960 did not reveal the presence of any fish (Azevedo and Wallis 1962). An angler who fished the lake in 1960, without knowing that it was closed to angling, reported trout were present. In follow-up investigations in 1961 , several trout were observed, and two specimens were collected. Dr. Robert Rush Miller, Curator of Fishes, University of Michigan Museum, could not positively identify the two specimens collected from Fay Lake as greenbacks due to the vagueness of the original description of greenbacks. Fish were not observed in Faylene or Caddis Lakes.

In the early 1960's stocking records were found that showed that Yellowstone cutthroats were stocked into Forest Canyon in 1922 and 1923. With the fish in Forest Canyon found to be contaminated the project in the Fay Lakes was abandoned and the drainage was returned to its original management status and stocked with cutthroat trout in 1962.

Two gill nets were set overnight in Fay Lake on 18 and 19 July 1972 without catching any fish (Mullen 1972). Evening and morning observations of the lake's surface failed to disclose any evidence of fish life. However, trout were observed to be relatively abundant in the inlet and in Caddis Lake proper. Six of these fish, 198 mm to 259 mm in length, were sampled by hook-and-line and taken to Dr. Behnke for analysis. He concluded (Mullen 1972):

"Six specimens collected in July 1972 from Caddis Lake were examined and found to be similar in their characters to the trout of the headwaters of the Big Thompson in Forest Canyon. The present Caddis Lake population were likely derived from a plant of Forest Canyon cutthroat trout into Fay Lake in 1959, although Fay Lake itself is now apparently barren of fish."

"Evidently, Fay Lake was stocked once more with cutthroat trout from an unknown source in the early 1960's. These trout, if supplied by Colorado Game and Fish, were probably from their Pike's Peak brood stock. The Pike's Peak cutthroat trout is not sharply differentiated from Forest Canyon trout, but does have lower mean values in scale counts and more numerous pyloric caeca. Both forms develop bright, almost gaudy colors, particularly in males during spawning. It is possible that some of the trout introduced into Fay Lake in the 1960's migrated downstream into Caddis Lake and hybridized with the previously established Forest Canyon population. If the subsequent introduction was from the Pike's Peak brood stock, it would be virtually impossible to detect the effects of slight hybridization. I am confident, however, that there is no influence of Yellowstone cutthroat trout in the Caddis Lake specimens examined, and they can be considered (phenotypically, at least) as a good representative of the greenback cutthroat trout, Salmo clarki stomias, once native to the waters of Rocky Mountain National Park."

Gill net surveys in 1979 (Rosenlund 1979) and 1988 found cutthroats to be abundant and in good health.

Current Population Status

A gill net survey conducted near the inlet on 9 July 1999 caught 18 greenbacks in 63 minutes. All fish were in good condition with all males ripe and exhibiting intense red coloration. Females were a week or two away from spawning. An additional 12 fish were caught in the inlet and one in the lake by hook-and-line. These fish were slightly larger on average than the fish caught in the lake, 244 mm compared to 225mm.

Tissue samples were collected from 15 fish and taken to Don Proebstel for genetic analysis. He determined that they were pure greenback cutthroat trout from a single source.

Summary of Gill Net Sampling, Caddis Lake, Inlet Trend Site, 1979-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/10/79*	Greenback	227.76	189-275	no data	no data
07/20/88	Greenback	233.25	110-281	8.0	1.03
07/09/99	Greenback	225.61	169-296	17.1	1.95

* Overnight net set

Angler Use

Fishing pressure was described as sporadic in the early 1960's. Little visitation was apparent during sample collection in 1999.

Limited creel survey data suggests the same as net survey data, that the Caddis Lake greenback population is in good condition. Anglers reported catching fish in all three lakes(?) in 1968. One of those anglers reported catching six cutthroats in six hours from Caddis and Fay Lakes. Of the 13 fish that volunteers caught by angling in 1999, 12 were caught in the inlet stream.

Summary of Creel Survey Data, Caddis Lake, 1959-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1959	Exotic fish removed			
1962*	no data collected			
1968	8.00	2	0.5	Rainbow, cutthroat
1996	4.50	1	4.0	Cutthroat
1999	1.62	4	8.0	Cutthroat

* Open to angling, closed 1959 to 1961

North Fork Big Thompson River

The headwater lakes of the North Fork of the Big Thompson River drainage were stocked with trout in the 1930's, but failed to establish lake or stream fish populations above an elevation of 3,230 m (10,598 ft) (Bulkley 1959).

In 1970, 50 greenback cutthroat trout from Como Creek were introduced into the 1.7 km of the barren North Fork of the Big Thompson River, at an elevation of 3,230 m (10,598 ft) (Mullen 1970 and Stevens 1970). An electrofishing survey conducted in 1973 found no fish and it was assumed that the introduction failed. However, a reproducing population of greenbacks was documented here by 1978 (Rosenlund and Stevens 1989), and upstream migration of greenbacks into the shallow ponds below Lake Louise was observed in 1984. One greenback collected from the shallow ponds below Lake Louise was 393 mm in length with a condition factor (K) of 1.3. The North Fork greenback population was 15.7 greeenbacks/100 m of stream and 62.4 kg/ hectare of stream (55.6 lbs/ac) as measured above the stream junction at 3,291 m (10,978 ft), 14 August 1986.

By 14 August 1986, brook trout had migrated around the small barrier at 3,230 m, but were stopped by another small barrier at 3,279 m (10,758 ft). This new barrier was only a few meters below the greenback population established in 1970.

In August 1986, the 1970 North Fork project was expanded by removing brook trout from the entire North Fork drainage upstream of Lost Falls. The project included Lake Husted (4.09 ha), Lost Lake

Lost Lake

(3.48 ha), and 3 km of the North Fork, Map NF 1 and Table NF 1.

Lost Lake was treated 19 August with a total of eight units of antimycin including the antimycin applied to the inlets. Application of antimycin began at 0745, with moribund fish present in three hours. By 1600 brook trout to 300 mm were moribund, and all fish appeared dead by 2100. A total of 83 brook trout ranging from 95 mm to 365 mm in length were recovered from Lost Lake. The outlet flow of Lost Lake was blocked, but heavy afternoon rains raised the lake level to overflowing by dark.

Greenbacks originating from the 1970 introduction were found to have migrated downstream and were co-existing with the dominate brook trout population through the entire length of the North Fork upstream of Lost Falls. Of the 461 trout greater than 5 cm in length recovered between site 3 and the KMn04 station, 14.5% were cutthroats. In this section, brook trout did not exceed 280 mm in length, while greenbacks to 304 mm in length were collected.

The NPS did an excellent job of removing the old dam on Lost Lake in 1986, and began reseeding the bank with native plants in 1986. The North Fork of the Big Thompson River was stocked with 3,000 greenback fry on 16 September 1987, 7,000 greenback fry on 14 September 1989 and 1,500 greenback fry on 11 October 1990. Lake Husted was stocked with 2,000 greenback fry on 24 September 1986 and 2,000 greenback fry on 16 September 1987. Lost Lake was stocked with 4,000 greenback fry on 16 September 1987, 1,356 greenbacks at 161 mm in length on 30 June 1989 and 3,000 greenback fry on 14 September 1989. Lake Louise was stocked once on 14 September 1989 with 3,500 greenback fry.

Lake Louise and Lake Husted are currently experimental populations. For further information on these populations see the Experimental Greenback Introductions section, pages 123 and 125.

Current Population Status

Lost Lake. In 1998, a 25 minute gill net set caught 4 greenbacks for a catch rate of 9.75 greenbacks/net hour with two year classes present. Three fish ranged in size from 152 mm to 185 mm, with the fourth greenback measured at 340 mm. Only the largest fish, a male, was ripe.

Summary of Gill Net Sampling, Lost Lake, Outlet Trend Site, 1978-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
09/12/78*	Brook	292.68	210-356	0.72	no data
07/22/83*	Brook	294.00	217-375	1.30	0.33
08/15/86*	Brook	324.70	250-356	0.76	0.27
09/06/89	Greenback	217.00	168-275	37.00	4.04
09/05/90	Greenback	194.00	135-240	5.00	0.52

08/24/93	Greenback	251.71	156-360	3.50	0.82
06/30/98	Greenback	211.75	152-340	9.75	1.52

* Overnight net set

North Fork Big Thompson River. The North Fork was last electrofished from Lost Falls to the Horse Camp on 6 September 1989 (Rosenlund and Stevens 1989). Greenbacks averaged 145 mm, and were present in most pools from Lost Falls to the Sugarloaf Campsite. Electrofishing through the meadow at the Horse Camp produced no fish.

During hook-and-line surveys in 1993 a brook trout was caught near the Lost Meadow campsite. No other brook trout were caught or observed in three hours of angling. A report of brook trout being present was also made by RMNP Rangers in 1999. A brook trout removal project is scheduled for the North Fork in 2000.

As part of the *Minimum Habitat Requirements For Establishing Translocated Cutthroat Trout Populations* (Harig and Fausch 2000) study, see Special Studies and Projects section, page 9, a habitat survey was conducted on 1.8 km of the North Fork above a potential barrier at 3,282 m (10,768 ft) in 1997. An index of relative trout abundance of high was assigned to the North Fork with 62 greenbacks/km observed in pools. Using Harig and Fausch's stream-scale model for predicting translocation success, the habitat in the upper North Fork of the Big Thompson River has a 36.2% chance of becoming barren, a 52.5% chance of supporting low numbers of cutthroats and a 11.3% chance of supporting high numbers of cutthroats. Habitat variables used to calculate these probabilities were: 8.1 ° C mean daily July water temperature; 3.1 m mean bankfull pool width and 18 pools with a residual depth ≥ 30 cm. The watershed area for this section of the North Fork population was estimated to be 8.3 km^2.

Angler Use

Lost Lake. Catch rates averaged 0.41 fish/angler hour in the 1960's. Anglers reported catching 0.44 fish/angler hour prior to the restoration and 2.5 greenbacks/angler hour since. The highest catch rate, 4.2 greenbacks/angler hour, reported at Lost Lake occurred in 1990, the year the lake opened to catch-and-release angling.

Summary of Creel Survey Data, Lost Lake, 1960-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1960	0.55	11	59.0	Brook, cutthroat
1961	0.36	46	359.0	Brook, cutthroat
1962	0.53	12	108.0	Brook, cutthroat
1963	0.16	14	50.0	Brook
1964	0.41	14	68.0	Brook, cutthroat

1965	0.54	15	52.0	Cutthroat, brook
1966	0.44	1	32.0	Cutthroat, brook
1967	0	3	2.0	
1969	3.50	5	10.0	Cutthroat, brook
1974	0	2	6.0	
1984	0.25	2	4.0	Rainbow
1986	Exotic species removed			
1990*	4.20	4	6.5	Cutthroat
1992	1.00	2	4.0	Cutthroat
1994	1.25	3	4.0	Cutthroat
1999	0	2	4.0	

* Opened to catch-and-release angling, closed 1986-1989

North Fork Big Thompson River. The North Fork of the Big Thompson River above Lost Falls opened to catch-and-release angling in 1990. In 1996, one angler fishing near Lake Louise reported catching 16 greenbacks in 4 hours and two anglers fishing above Lost Falls reported catching 13 greenbacks in 5 hours of fishing.

Summary of Creel Survey Data, North Fork Big Thompson River, 1974-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1974	2.13	2	8	Cutthroat
1986	Exotic species removed above Lost Falls			
1990*	no data collected			
1996	3.22	3	9	Cutthroat

* Opened to catch-and-release angling, closed 1986-1989

Map NF 1. North Fork Big Thompson River Greenback Restoration Sites and Location of Treatment Sites, 1986.

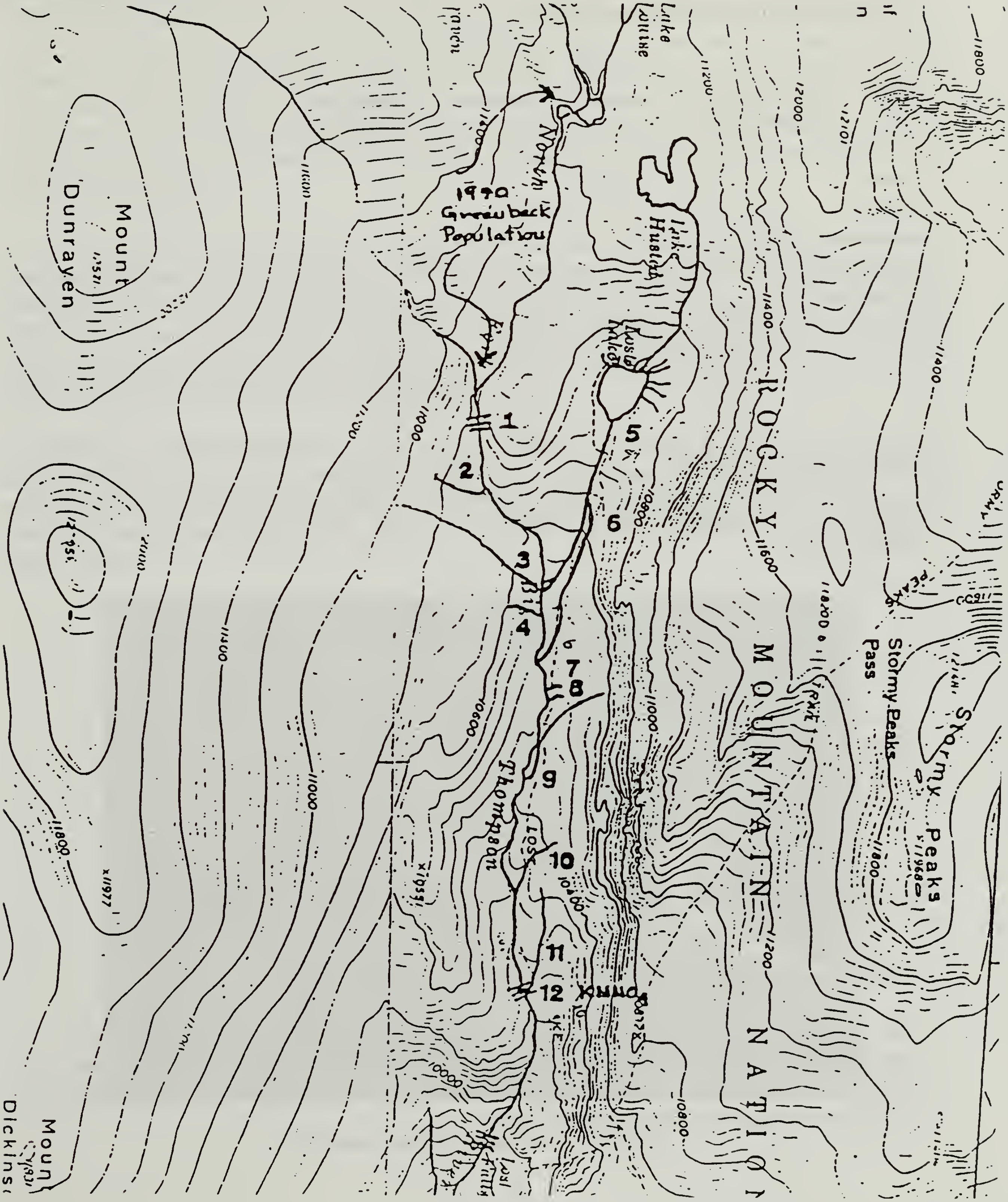


Table NF 1. Amount of Antimycin Applied to Husted Lake, Lost Lake and the North Fork of the Big Thompson River, 18-19 August 1986.

Site	Flow (CFS)/ Volume (ACF)	Conc. Ant.	Duration	Total Units Antimycin
Husted	75 ACF	4.0 ug/l		7.0
Lost Lake	86 ACF	3.6 ug/l		8.0
North Fork Sites:				
1	5.0 CFS	8.0 ug/l	8 H	1.04
2	1.0 CFS		8 H	0.14
3	1.1 CFS		8 H	0.31
4	1.5 CFS		8 H	0.20
5	1.0 CFS		8 H	0.13
Spray outlet of Lost Lake				0.21
Total to N.F. at elev. 10,480'	9.7 CFS	12.7	8 H	2.03
6	0.1 CFS		8 H	0.05
7	0.1 CFS		8 H	0.05
8	0.1 CFS		8 H	0.05
* Total Antimycin to N.F (1 thru 8)	14.0 CFS	9.6*	8 H	2.18
KMn04	14.0 CFS	1.0 mg/l	12 h	

*includes antimycin applied to 6 inlets in 8 hours

Note: from site 1 to site 8, loss of 600 feet in elevation. Fish reacted slowly to antimycin indicating a high loss of antimycin, although it only took 1.83 hours for the dye to travel from station 1 to station 8. An additional 4 ug/l should have been added at the horse camp (10,480' elevation) to compensate for the elevation loss.

Hidden Valley Creek

Hidden Valley was the first site for a roadside greenback cutthroat trout restoration project in 1973. It was also the first site were the EPA approved antibiotic Antimycin was used for removal of exotic fish species (brook trout) in RMNP, and the first, and last, area where removal of brook trout from a large beaver pond complex was attempted. Following the treatment of approximately 1.6 km of stream and 2.4 ha of beaver pond habitat upstream of a barrier at 2,727 m (8,950 ft) in 1973 (Mullen 1973), the creek was restocked with 82 adult and sub-adult greenback cutthroat trout from Como Creek in October 1973.

By 1976 brook trout were once again found in the creek, just downstream from the beaver pond complex (Stevens and Mullen 1976). In an attempt to control brook trout in the stream and beaver pond habitats, an electrofishing and fyke netting program was undertaken to remove brook trout from 1977 to 1986. Each year the entire length of the creek was electrofished and fyke nets were set in the beaver ponds. All brook trout collected were removed and all greenbacks collected were released. This program maintaned the greenback population.

To improve the stream brook trout removal program, two stream sections were electrofished 17 and 19 September 1985, and then cyanided on October 22 to determine the effectiveness of the two methods in removing brook trout (Rosenlund and Stevens 1989). This experiment showed that the cyanide collection was almost 100% effective, compared to a 50% efficiency for a single pass of electrofishing.

Hidden Valley Creek Beaver Ponds

Following the removal of brook trout with NaCN in 1985, it was hoped that there would be considerably less brook trout in these sections as of October 1986. However, the 1986 brook trout population in one section actually increased over 1985, and the brook trout in the other section remained about the same as in 1985 (Rosenlund and Stevens 1986).

Brook Trout Population

Date	Section	Method	(Range mm)
10/22/85	1	NaCN	20 (45-220mm)
10/23/86	1	Electro	138 (65-285mm)
10/22/85	2	NaCN	51 (65-294mm)
10/23/86	2	Electro	36 (70-285mm)

Section 1 extends from the boardwalk pond downstream to the picnic area and Section 2 extends from the picnic area downstream to the bridge.

The results of this project demonstrates that the fall population of brook trout downstream of the beaver ponds represents mainly migratory brook trout, not excessive carry-over of resident brook trout missed each year. Adults removed one week are replaced within a few weeks by brook trout migrating downstream to spawn.

In 1987 funding was not available to conduct the brook trout removal program. When the program resumed in 1988 brook trout had become the dominate fish species in the creek (Figure 5, page 62). Removal of the brook trout in subsequent years did not change this and the program was halted. Limited sampling of the stream in 1995 and 1997, and extensive sampling in 1998 showed that brook trout comprised over 98% of the fish in Hidden Valley Creek.

Supplemental stockings to infuse new genetic material into the Hidden Valley population occurred in 1989 and 1990. Six hundred thirty-two 161 mm greenbacks were stocked in June 1989 and 736 greenback fry were stocked into two locations along Hidden Valley Creek in October 1990.

Spawning habitat is limited in the Hidden Valley beaver ponds, with some greenbacks in the boardwalk pond migrating downstream as far as the picnic area to spawn. This migration was documented through the capture of boardwalk pond marked greenbacks captured near the picnic area in June, then recaptured in the boardwalk pond in October.

Hidden Valley is considered as a valuable area to have greeenbacks. Trail Ridge Road, the only road which transverses the park, parallels the creek for 2.7 km. Because of this, the creek has several roadside facilities including an interpretive boardwalk through the beaver pond complex and several picnic areas. The road and its accompanying facilities bring thousands of people in contact with the creek each year making it an ideal location for a watchable wildlife program and interpretive program for endangered species management.

Although Hidden Valley Creek has many advantages another attempt at restoration was not considered due to the difficulty in removing brook trout from the beaver ponds and the associated complex of tunnels and back waters. However, in the early 1990's the beaver population started to decline and by 1999 only a few ponds remained during periods of low flow. This low cycle in the beaver and native willow populations provides for an opportunity to more effectively remove brook trout and another attempt at restoration of the area will be done in the near future.

Current Population Status

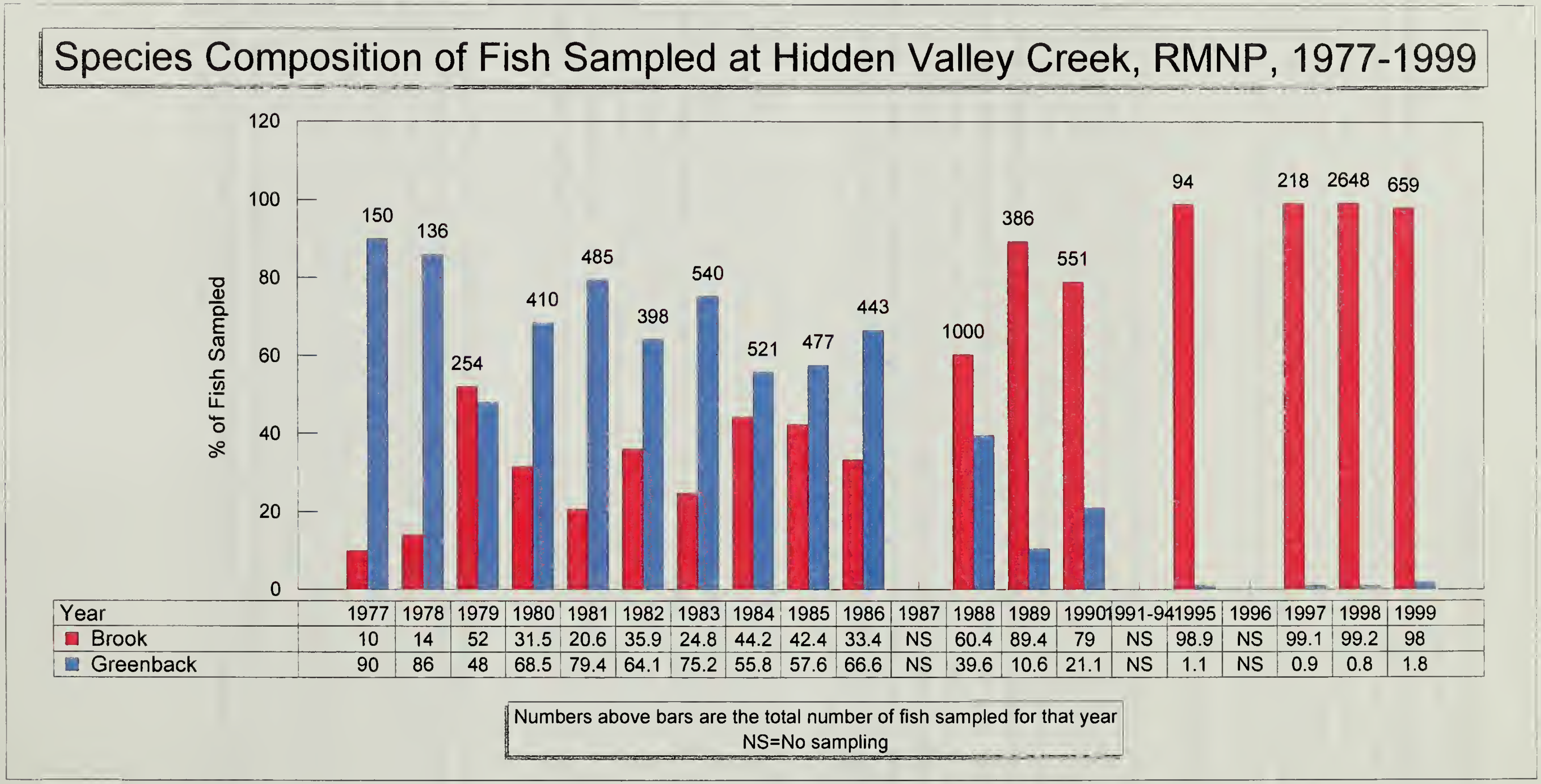
In an attempt to salvage as many fish as possible before restoration, Hidden Valley Creek was electrofished extensively in 1998. The entire length of the creek above the barrier was electrofished at least once with meadow sections done up to three times. A total of 2,648 brook trout were removed and stocked into waters adjacent to RMNP with all greenbacks sampled being replaced. These surveys found brook trout to constitute 99.24% of the fish population. Only 20 greenbacks were sampled over the five days of electrofishing, with at least 4 of these fish believed to be recaptures. Greenbacks ranged in size from 42 mm to 250 mm with an average of 196 mm. Fish removal was also conducted in 1999 along two sections of the creek. Six hundred forty-six brook trout weighing 18.8 kg and 12 greenbacks were removed from the creek. Greenbacks averaged 210 mm in length over a size range of 154 mm to 270 mm. The brook trout were stocked outside RMNP while the greenbacks were marked and stocked into Lily Lake.

Angler Use

Starting in 1982, the beaver pond habitat of Hidden Valley Creek was opened to catch-and-release fishing for greenbacks and catch-and-kill fishing for brook trout, from August 1 to March 31, as an experiment to document the response of greenbacks to angling and the possibility of controlling brook trout with angling. This was the first pure greenback population opened to public fishing. When it first opened this fisheries was popular with the fly fishermen, with articles on this fisheries appearing in Fly Fishermen Magazine, Sports Afield, Trout Magazine, and Colorado Outdoor Journal.

The experimental angling program demonstrated that although brook trout dominated the beaver pond population in 1982 (191:55), greenbacks provided the majority of the angler catch rate. From 1982 to 1986, anglers landed 0.86 to 1.6 greenbacks per hour and 0.4 to 1.34 brook trout per hour, and released 45 to 64% of the brook trout landed. Although anglers are encouraged to remove brook trout from Hidden Valley Creek, Hidden Valley anglers release brook trout at about the same rate as they do throughout RMNP.

In 1987, angler use and the catch rate of greenbacks declined during opening week. The average catch rate for greenbacks was 0.45, while the catch rate of brook trout remained similar to



Year	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991-94	1995	1996	1997	1998	1999
🟥 Brook	10	14	52	31.5	20.6	35.9	24.8	44.2	42.4	33.4	NS	60.4	89.4	79	NS	98.9	NS	99.1	99.2	98
🟦 Greenback	90	86	48	68.5	79.4	64.1	75.2	55.8	57.6	66.6	NS	39.6	10.6	21.1	NS	1.1	NS	0.9	0.8	1.8

Figure 5

previous years at 0.87 brook trout/hour during opening week. However, the overall season catch rate for greenbacks was similar to previous years at 1.00 fish/hour.

Some anglers had difficulty identifying the two species, with as many as 7% of the greenbacks landed being mistakenly kept by anglers. To help reduce the amount of greenbacks taken by anglers, color signs have been posted, and handouts are available that have comparative color paintings of the two species.

Of 56 anglers interviewed in 1987 who had completed their angler day, anglers expressing satisfaction with the number, length of fish caught, and overall experience at Hidden Valley was 60.7%, 64.2, and 69.6% respectively.

Since 1994, brook trout catch rates have been greater than greenback catch rates. No greenbacks were reported caught in 1996 or 1998.

Summary of Creel Survey Data, Hidden Valley Creek, 1961-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1961	4.00	5	7.8	Brook
1969	0.67	1	3.0	Brook
1971	0	13	10.0	
1972	0.57	16	28.0	Brook
1973	0.07	8	14.0	Brook
1973	Exotic species removed			
1982*	1.26	475	no data	Cutthroat, brook
1983	1.32	248	no data	Cutthroat, brook
1984	2.65	122	258.0	Cutthroat, brook
1985	3.01	42	124.5	Cutthroat, brook
1986	2.14	104	311.0	Cutthroat, brook
1987	1.00	76	213.1	Brook, cutthroat
1988	1.00	52	114.0	Brook, cutthroat
1989	6.42	14	33.0	Cutthroat, brook
1990	2.10	67	189.0	Brook, cutthroat
1991	4.10	50	92.4	Brook, cutthroat
1992	2.20	30	38.0	Cutthroat, brook, brown
1993	2.96	13	8.1	Cutthroat, brook
1994	1.48	26	52.0	Brook, cutthroat, brown, rainbow
1995	1.62	108	60.4	Brook, cutthroat
1996	0.66	2	4.5	Brook
1997	3.06	7	15.0	Brook, cutthroat
1998	1.60	1	2.5	Brook

1999	1.50	3	6.0	Brook, cutthroat

* Opened to catch-and-release for greenbacks and catch-and-kill for brook trout, closed 1973-1981

Special Studies

To document the mechanisms of competition between brook trout and greenbacks, an M.S. thesis was funded by Rocky Mountain National Park. This study was conducted in the stream habitat of Hidden Valley Creek by Tim Cummings, under the direction of Dr. Kurt Fausch, Colorado State University (1986).

The results of this study indicates that brook trout juveniles were the dominant competitor, and excluded juvenile greenbacks from energetically favorable stream positions. Evidence of interactions between greenbacks and brook trout greater than 150 mm in length was minimal, so these interactions were not considered a major factor in cutthroat displacement. The authors also felt that low water years negatively impacted greenbacks, by reducing backwater habitat and forcing YOY greenbacks into the main channel where they compete against larger fish and expend more energy to maintain position.

Watchable Fish

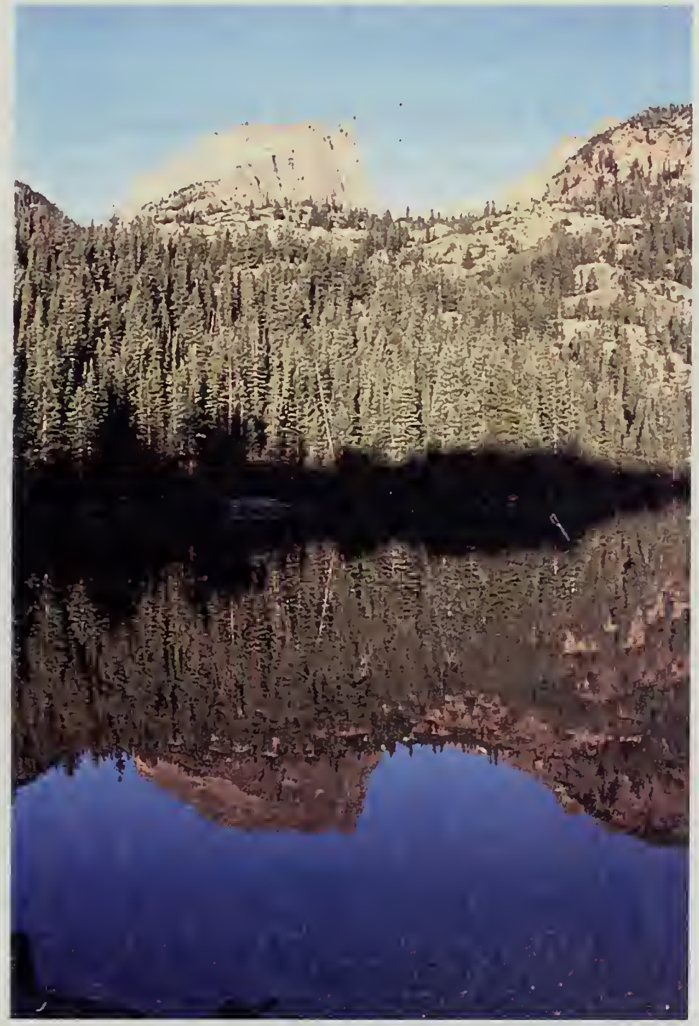
Hidden Valley Creek would make an excellent place for a watchable fish program. The interpretive boardwalk currently has signs pertaining to beavers. Since there currently is no beaver activity in this area, some or all of these signs can be converted to greenback cutthroat trout interpretive signs or new signs can be added. Thousands of people visit this area annually because of its proximity to Trail Ridge Road, making Hidden Valley potentially an excellent area to educate visitors about greenbacks.

Bear Lake

Brook trout were removed from 4.5 ha Bear Lake in 1975 with nine units of antimycin, and restocked with approximately 60 adult and sub-adult greenbacks from Como Creek by October 1975 (Mullen 1975). Survival and reproduction of the 1975 stocking appeared to be poor, with Bear Lake dominated by tiger salamanders by 1979. To improve survival, inlet spawning habitat was improved, and 432 Bozeman greenbacks at 150 mm in length stocked in 1981 (Rosenlund and Stevens 1989).

Although the best spawning habitat is present in the outlet, greenbacks appear to prefer the inlet. In an attempt to establish a spawning run in the outlet and improve the genetic diversity of the population, 200 Bozeman greenback sac fry were stocked into the outlet 11 July 1984, 500 fry were stocked into the outlet in September 1987, and 271 greenbacks at 161 mm in length were stocked into the outlet in June 1989.

Inlet spawning activity was first observed 7 July 1982, with successful inlet reproduction documented



Bear Lake

in October 1982. Two year classes of greenbacks (160 mm and 250 mm) were present by July 1982 and indicated reproduction had occurred prior to the 1982 stocking. From 1982 through 1986, inlet spawning activity was observed annually.

Spawning Bear Lake greenbacks were sampled on 11 July 1986, with fyke nets set overnight at the inlet and outlet. The outlet net captured no fish, and none were observed in the stream although excellent spawning substrate was present. The inlet contained three spawning greenbacks, and 11 greenbacks were captured in the fyke net set near the inlet. Greenbacks captured in the fyke net ranged from 190 mm to 462 mm and appeared to represent five year classes. The Bear Lake Ranger reported that inlet spawning had started in mid-June, with the run declining by 5 July. On 11 July inlet and outlet water temperatures at 1400 were 10.5 and 17.2 C respectively.

Since the outlet water temperature is higher, outlet spawning could occur earlier than in the inlet. To determine if outlet spawning was occurring, Bear Lake rangers checked for spawning activity and measured inlet and outlet water temperatures starting 22 June 1987. Spawning activity was observed in the inlet by 29 June with inlet flows of 8° C. Outlet flows were 16° C by 22 June, with no spawning activity reported in the outlet during 1987.

Inlet flows were very low in 1988, but rangers reported the inlet full of spawning greenbacks by late June 1988.

Due to the dry winter of 1988-1989, greenbacks in Bear Lake were spawning by 22 June 1989. About 600 eggs were collected from the inlet greenback run for the new CDOW South Platte captive broodstock program in 1989. No spawning activity was observed in the outlet.

The Bear Lake greenback spawning run appeared to serve as a food source for other species (raccoons), with greenback opercules, fins and cached fish found near the inlet, 11 July 1986.

Although inlet spawning is limited, the Bear Lake greenback population should be considered as stable, and counted toward the Recovery Plan objective of 20 stable populations. Brook trout have been absent for 25 years, and several year classes of greenbacks exist between 190 mm to 462 mm in length.

Current Population Status

Fyke net surveys have not been conducted since 1989. Greenbacks started spawning in the inlet around 10 June in 1998, with the spawning run ending shortly after 11 July. The spawning run peaked around 22 June with about 25 greenbacks, estimated between 203 mm to 356 mm in length, observed in the limited spawning habitat. No fish were observed in the outlet in 1998.

Angler Use

Due to the conflicts between anglers and non-anglers at this popular vista, Bear Lake was closed to all angling years prior to the introduction of greenbacks. Due to these conflicts, this area will probably never be open to angling.

Summary of Creel Survey Data, Bear Lake, 1958-1962

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	0.16*	no data	3728.0*	Brook, rainbow
1959	0.36*	no data	6028.0*	Brook, rainbow
1960	0.70	20	60.0	Rainbow, brook
1961	0.90	12	30.0	Brook, rainbow, cutthroat
1962	Closed to angling			

* Estimates

Watchable Fish

In most years, an impressive number of large greenbacks concentrate in the inlet for spawning, with some fish to 20 inches in length observed. Due to the size of Bear Lake greenbacks and the number of Bear Lake visitors, this area would make an excellent place for a “watchable fish program”.

Bridge Over Bear Lake Inlet Greenback Spawning Area

West Creek

Brook trout were removed from 2.4 km of stream habitat above West Creek Falls in 1978, and originally restocked with 58 adult and sub-adult greenbacks from Hidden Valley Creek in 1979 (Rosenlund and Stevens 1989).

One hundred immature (1+) adipose clipped Bozeman greenbacks at 140 mm in length were stocked above the junction with the stream to the south on 11 July 1984, 500 greenback fry were stocked into the upper meadows in September 1984, and 2,000 greenback fry were stocked in 1987 and 1989.

Hidden Valley greenbacks were stocked into the meadows near timberline and upstream of where the old phone line crossed West Creek. Greenbacks stocked near the old phone line in 1979 migrated downstream to below the falls. Greenbacks stocked in the upper meadow in 1979 were present, but no reproduction was documented in 1983. On 11 September 1984, 500 greenback fry were stocked into the upper meadow.

West Creek Falls

In October 1986, West Creek was shocked from the West Creek Falls upstream through the July 1984 stocking site. No greenbacks were found until the July 1984 stocking site was reached, with seven marked greenbacks 195 mm to 225 mm in length captured in a single pass through the stocking site.

No brook trout were found upstream from West Creek Falls, but five brook trout 150 mm to 229 mm in length and one unmarked 207 mm greenback was captured from a pool near the base of the falls.

An electrofishing survey of the upper meadows, 3,048 m (10,000 ft) in July 1987, found only a few greenbacks at 120 mm to150 mm in length, and no signs of long term survival of greenbacks stocked in 1979.

Electrofishing of West Creek in 1988, found marked greenbacks stocked in 1984 still present in 1988, along with 100 mm greenbacks that probably originated from the stocking of fry in 1987. Electrofishing on 12 September 1989, within the area where the 140 mm were stocked in July 1984, recovered four of the marked fish within the reach of stream stocked.

As part of a study conducted by Harig and Fausch (2000), Colorado State University, into the habitat requirements needed for successful greenback cutthroat trout populations, see *Minimum Habitat Requirements For Establishing Translocated Cutthroat Populations* in the Special Studies and Projects section page 9, habitat surveys were conducted in 1998. The creek was surveyed from West Creek Falls to a series of cascades at 2867 m (9,406 ft), a total of 5 km. Greenbacks were observed in most pools, with one or two per pool, from West Creek Falls to a barrier at an elevation of 2720 m (8,924 ft), a total of 3.2 km. Few small fish were observed. West Creek was assigned a population status of low with 16.4 greenbacks/km observed in pools over the entire length of the survey section. The density of greenbacks for the inhabited section of the creek was 25.6 greenbacks/km observed in pools.

Using Harig and Fausch's stream-scale model for predicting translocation success, the habitat in West Creek has a 5.7% chance of becoming barren, a 39.6% chance of supporting low numbers of cutthroats and a 54.7% chance of supporting high numbers of cutthroats. Habitat variables used to calculate these probabilities were: 7.1° C mean daily July water temperature; 4.1 m mean bankfull pool width and 117 pools with a residual depth $\geq$ 30 cm. Although the probability for West Creek to support high numbers of cutthroat trout is high based on this model, it is believed that low water temperatures will always inhibit this population. The watershed area of West Creek was estimated at 25.3 km^2.

Current Population Status

An electrofishing survey conducted in 1999 above West Creek Falls found greenbacks to have a density estimate of 3.67 fish/100' and a biomass estimate of 17.3 kg/ha. The average length of the fish samples was 179 mm over a size range of 137-242 mm. The biomass estimate is too low for West Creek to be considered stable at this time. A more extensive survey is planned in the near future on the entire population.

Angler Use

West Creek is currently closed to angling. Prior to the restoration of West Creek, catch rates averaged 2.36 fish/angler hour based on data collected in 1958, 1959 and 1975.

Summary of Creel Survey Data, West Creek, 1958-1978

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	3.71	no data	49.1	Brook, cutthroat
1959	1.61	no data	98.8	Brook, cutthroat
1963^	3.25	1	10.0	Brook, cutthroat
1975	2.00	1	4.0	Brook
1978	Exotic species removed, closed to angling			

^ Angler reported fishing above and below West Creek Falls, brook trout caught above falls and cutthroat caught below falls

West Creek, Below West Creek Falls

The best trout habitat of West Creek is downstream of West Creek Falls, and outside of Rocky Mountain National Park. In accordance with the Recovery Plan, the Forest Service completed a fish barrier 2.4 km downstream of the West Creek Falls in 1984. Due to problems with this barrier, and abnormally high water flows during 1984, removal of brook trout from this area was postponed until 1985 (Rosenlund and Stevens 1989).

In 1985, a public hearing was held on the pending West Creek project. It was thought there was little public interest in the project, and the meeting was mainly held to inform people of the project. However, negative comments were received from Glen Haven residents. Another public meeting held in 1986, found citizens of Glen Haven remaining opposed to the projects. Following the 1986 meeting, a petition against the project was circulated. A congressional letter was received along with threats to blow up the barrier and restock brook trout.

Due to the severity of the public comments on the project compared to the amount of habitat to be gained, the Forest Service delayed this project for a minimum of five years. To date this area has not been restored.

Greenbacks were collected in this section of West Creek (below West Creek Falls) when sampled in 1983 and 1986, with reports of greenbacks being caught below the Forest Service barrier received through 1992. A single pass electrofishing survey was conducted in 1999 a few hundred feet below West Creek Falls. No greenbacks were sampled in this survey, however one was observed within the survey section.

Ouzel Lake and Creek

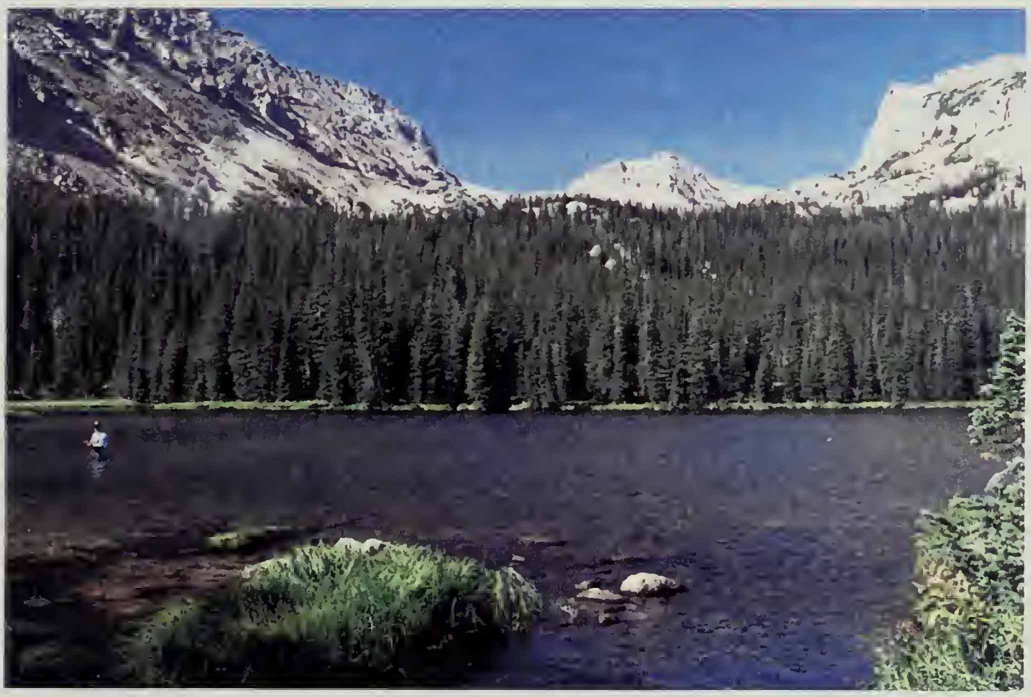
Ouzel Lake. Ouzel Lake is located in the headwaters of the North St. Vrain drainage, RMNP at an elevation of 3,048 m (10,000 ft). It has a surface area of 2.6 ha, with a maximum depth of 1.07 m, and August outlet flows of 0.42 to 0.68 cms.

On 12 August 1980, brook trout were removed from Ouzel Lake and 4.7 km of Ouzel Creek upstream from Ouzel Falls with antimycin, Map Oz 1 and Table Oz 1 (Rosenlund and Stevens 1989).

Following the removal of brook trout, this area was stocked with Bozeman greenback cutthroat trout in 1981, 1982 and 1983. During this three year period, Ouzel Lake received 13,480 greenbacks and Ouzel Creek received 14,590 greenbacks.

Based upon brook trout removed after treatment with antimycin, Ouzel Lake contained 2,366 brook trout weighing 140 kg, or 53.8 kg of brook trout per ha of lake.

Ouzel Lake was the first lake stocked with Bozeman greenbacks, with annual stocking rates estimated to be 2,470 fish/ha for fish 29 mm to 44 mm in length. Restoration lakes were scheduled to be stocked for three consecutive years, for a three year total of 7,410 fish/ha. However, the survival of Bozeman greenbacks was greater than expected, with stocking reduced to a total of 13,480 (5,184 fish/ha) from 19,226 (7,410 fish/ha) greenbacks originally requested for three years



Ouzel Lake

of stocking.

Based upon gill net data, the stocking of 13,480 greenbacks from 1981 through 1983, appears to have resulted in greenback numbers and weight that greatly exceeded the 1979 brook trout population by 1984.

A Petersen population estimate was conducted at Ouzel Lake in August 1987, 1988 and 1989. Dr. Eric Bergersen and staff from CSU collected and marked 745 greenbacks in 39.15 hours of angling (19.02 fish/hour) on the 19 to 20 of August 1987 (Bergersen 1988a). On 21 August Ouzel Lake was gill netted, with the net capturing 20 greenbacks, of which 6 were marked. This resulted in a population estimate of 2,238 greenbacks and a biomass of 61 kg/ha. Due to the low numbers of recaptures in the net the 95% C.I. on this estimate is 1137 to 6772 fish. The 1987 population and biomass of Ouzel Lake appears to be similar to that in 1980.

The Ouzel Lake estimate was repeated in 1988, with 614 fish captured, of which 59 were marked (Shively 1989a). The 1988 estimate was very similar to the 1987 estimate - 2,273 fish - but the 95% C.I. was 1,755-2,791 due to an improved recapture sample. The biomass estimate was repeated in 1989, with the total biomass estimated at 179.76 kg, or 69.14 kg/ha (Shively 1989b).

A 176 mm male and a 206 mm female greenback examined in September 1985 were found to be mature, with eggs ready for spawning in the spring of 1986. Electrofishing of the outlet and inlet of Ouzel Lake failed to produce any YOY during October 1986. However, greenback YOY were abundant in the inlet and outlet of Ouzel Lake in October 1987 and 1988. Water flows were limited in 1989, with very few YOY and adults present in the outlet and inlet stream area by 13 October 1989.

Since 1983, the average length of greenbacks caught in gill net surveys has increased at both the inlet and outlet trend sites almost every time the lake has been surveyed. The only exception to this was 1988 when the greenbacks sampled at the inlet trend site averaged 204 mm which was 3 mm shorter than the previous sampling in 1987. No brook trout were observed through 1993(Rosenlund et al. 1994).

Ouzel Creek. Exotic fish were removed from 4.7 km of stream above Ouzel Falls on 12 August 1980. Brook trout were removed from the stream near and below Ouzel Lake, and cutthroat trout were removed from a small hanging valley located upstream of Ouzel Lake, Map Oz 1 and Table Oz 1.

From 1981 through 1983, a total of 14,590 Bozeman greenbacks 27 to 44 mm in length were stocked into the 4.7 km of Ouzel Creek. Estimated annual stream stocking rates for greenbacks was 621 fish/km of stream, with 8,756 scheduled for the stocking of Ouzel Creek over three years. This stocking rate appeared low, and was adjusted upward to 1,034 fish/km, with 14,590 greenbacks 29 to 44 mm in length actually stocked in three years.

Based upon fish collected following the 1980 antimycin treatment, cutthroat in the harsh habitat of the hanging valley upstream from Ouzel Lake averaged 5.6 fish/100 m of stream.

A total of 1,829 brook trout were removed by hand and measured, from the outlet of Ouzel Lake to Ouzel Falls, or approximately 81 brook trout and 3.4 kg/100 m of stream. Cutthroat trout collected were up to 330 mm in length, while brook trout did not exceed 260 mm in length in 1980.

Electrofishing surveys conducted in 1982, 1983, and 1984 found no brook trout in the stream, other than the one brook trout found in the outlet of Ouzel Lake. However, on 12 September 1985, an electrofishing survey of Ouzel Creek collected three year classes of brook trout. All brook trout were found below a small barrier located 0.5 km downstream from Ouzel Lake. The area with brook trout was below a barrier where the stream divided into several channels and back waters, and was treated three times during the 1980 antimycin project.

To confirm that the brook trout are isolated below the one small barrier, the stream section above the barrier to Ouzel Lake was sampled with NaCN in 1985, 1986 and 1987. No brook trout were found above this barrier until 1987, when adult brook trout were found in small numbers all the way to the outlet of Ouzel Lake.

Another barrier exists about 50 m downstream of the outlet of Ouzel Lake. This barrier was improved by the RMNP Resource Crew in 1988, but one brook trout was found in the inlet in October 1988. No brook trout were found above this barrier in 1989, with marked greenbacks from the Ouzel Lake population study present below the barrier in 1988 and 1989, and indicated that fish were unable to return to the lake after crossing the barrier. Below the barrier, good numbers of spawning greenbacks were present in 1987 and 1988, but no YOY were captured in October 1989.

Current Population Status

Ouzel Lake. In 1998, gill net surveys were conducted at the inlet as well as the oulet trend site. Ouzel Lake has several inlets and a gill net survey was conducted at the second northernmost inlet with the net set out from the inlet into the lake. The trend site which has been used in the past is located at another inlet. The lake is very shallow around the inlets and the net was not fully deployed with less than 2 feet of net fishing for most of its length. In spite of this one greenback was caught in a one hour net set. This female greenback measured 286 mm and weighed 210 g. The gill net set at the outlet trend site caught 21 greenbacks and 7 brook trout in a 25 minute set. This is the first time brook trout have been found in Ouzel Lake since the restoration. Greenbacks averaged 268 mm with a size range of 204 mm to 346 mm. Brook trout averaged 304 mm with a size range of 209 mm to 396 mm.

In 1998, greenbacks were first observed spawning in the inlet on 29 June at a temperature of 5.5° C. Fish observed in the inlet in 1998 were estimated between 180 mm and 360 mm. Greenbacks were first observed in the outlet on 14 July. Greenbacks in the outlet were also estimated to be between 180 mm and 360mm. In both the inlet and outlet larger fish were observed earlier with smaller fish being observed as the spawning run went on. The peak of the spawning run occurred around 14 July and ended shortly after 21 July.

Summary of Gill Net Sampling, Ouzel Lake, Inlet Trend Site, 1984-1999

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
09/13/84	Greenback	163.27	123-205	64.7	3.29
09/12/85	Greenback	187.07	151-230	76.5	4.23
08/21/87	Greenback	207.46	172-240	13.0	2.23
08/05/88	Greenback	203.73	170-237	13.0	1.30
10/12/89	Greenback	216.70	128-260	8.0	0.90
09/21/91	Greenback	238.13	199-266	22.7	3.18
10/07/93	Greenback	249.75	206-270	3.2	0.47
09/08/98˜	Greenback	286.00	286	1.0	0.21

˜ Net set at second northernmost inlet, others set at main inlet trend site

Summary of Gill Net Sampling, Ouzel Lake, Outlet Trend Site, 1979-1999

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/16/79*	Brook	202.70	114-251	1.9	0.19
09/09/83	Greenback	115.00	110-120	0.4	no data
09/13/84	Greenback	172.78	136-191	no data	no data
09/12/85	Greenback	180.76	143-223	16.7	no data
10/08/86	Greenback	197.07	170-216	9.3	0.73
08/21/87	Greenback	211.42	196-224	7.0	1.18
09/08/98	Greenback	268.33	204-346	51.2	10.16
09/08/98	Brook	303.57	209-396	17.1	5.24^

* Overnight net set
^ This number is low, two fish exceeded capacity of scale being used

Ouzel Creek. An electrofishing survey conducted in 1991 at a trend site above Ouzel Falls showed that 85% of the fish sampled were brook trout. The same site was sampled in 1998 with 91% of fish being brook trout. The population estimates for this site was 4.33 greenbacks/100' and 44.71 brook trout/100'. Densities were 23.63 kg/ha for greenbacks and 176.84 kg/ha for brook trout. Greenbacks ranged in size from 195 mm to 223 mm for an average of 210.3 mm, with no deformities observed. Brook trout averaged 193.3 over a size range of 60 mm to 246 mm. All brook trout sampled were removed from this section.

An increase in brook trout has also been observed at a trend site below the small barrier below Ouzel Lake. In 1993, brook trout accounted for 18% of fish sampled at this location. By 1998 they represented 55% of the fish caught. The population estimate for brook trout was 27.45 fish/100' with a density of 238.26 kg/ha. Brook trout averaged 203.6 mm over a range of 159 mm to 262 mm. Greenbacks were estimated to be 22.2 fish/100' with a density of 126.53 kg/ha. The size range for greenbacks was 110 mm to 309 mm with an average of 215.13 mm.

This data, plus the fact that brook trout were found in Ouzel Lake for the first time in 1998 indicates that the greenback population is in decline. No brook trout have been found in the hanging valley above Ouzel Lake.

Disease sampling was conducted at the trend site above Ouzel Falls in 1998, with all fish found to be whirling disease negative.

In an effort to give greenbacks a competitive advantage a brook trout removal project was conducted in 1999. Five hundred eighty-eight brook trout weighing 37.5 kg were removed from a 5,500 foot section of the creek using single pass electrofishing. A limited number of brook trout were measured with adults averaging 197.4 mm and all brook trout measured over a size range of 40-262 mm. Thirty-four greenbacks or 5.4% of fish collected were sampled over the same stretch. Adult greenbacks averaged 218.5 mm with all greenbacks over a size range of 41-260 mm. At the time of the project flows were high and there was a lot of large woody debris which limited capture efficiency. It was estimated that 50% of the fish that were observed were captured.

The allopatric greenback population in the hanging valley above Ouzel Lake was included in the *Minimum Habitat Requirements For Establishing Translocated Cutthroat Trout Populations* study (2000 and see Special Studies and Projects section, page 9). Habitat surveys conducted on this 1 km section in 1997 observed 36 greenbacks/km in pools, with a population status of low assigned. Using Harig and Fausch's stream-scale model for predicting translocation success, the habitat in upper Ouzel Creek has a 48.9% chance of becoming barren, a 44.1% chance of supporting low numbers of cutthroats and a 7.1% chance of supporting high numbers of cutthroats. Habitat variables used to calculate these probabilities were: 6° C mean daily July water temperature; 4.1 m mean bankfull pool width and 12 pools with a residual depth $\geq$ 30 cm. The watershed area for Ouzel Creek was estimated at 7 km^2.

Angler Use

Ouzel Lake. Considerable angling pressure was reported in 1962 due to the fact that Ouzel Lake is on a maintained trail. Ouzel Lake opened to catch-and-release fishing for greenbacks in 1986, with twelve anglers landing an average of 3.1 greenbacks per hour, with 21% of the greenbacks landed 200 mm to 250 mm in length. No greenbacks were kept by the 12 anglers interviewed in 1986. During the October 1986 gill netting survey, 14% (2/14) of the fish sampled had some obvious signs of hooking damage to the jaw. Brook trout first appeared in the creel survey data in 1995 when two anglers fishing for 7 hours reported catching 15 brook trout and 8 greenbacks. Anglers in 1998 also reported catching more brook trout than greenbacks, however these anglers also were fishing in Ouzel Creek. During gill netting surveys in 1998 a volunteer fishing for 45 minutes in the outlet area caught 19 greenbacks and no brook trout prior to the area being surveyed. In 1999 all fish reported caught were greenbacks. Catch rates at Ouzel Lake since the restoration, 2.26 fish/angler hour, have exceeded those prior to the restoration, 1.30 fish/angler hour.

Summary of Creel Survey Data, Ouzel Lake, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	2.00	no data	237.5	Brook
1960	1.85	12	33.0	Brook, cutthroat
1961	0.74	14	129.0	Brook, cutthroat
1962	0.70	4	20.0	Brook
1963	0.95	15	42.0	Brook, rainbow, cutthroat
1965	1.68	8	31.0	Brook, cutthroat
1966	0.41	29	229.0	Brook, rainbow, brown
1967	1.23	36	97.0	Brook, cutthroat, rainbow
1968	1.43	20	58.0	Brook, cutthroat
1969	2.17	66	126.0	Brook, cutthroat, rainbow
1972	5.00	1	2.0	no data
1974	1.17	11	36.0	Brook, cutthroat
1976	0.65	5	7.8	Brook
1980	Exotic species removed			
1986*	3.10	12	28.0	Cutthroat
1992	5.00	1	3.0	Cutthroat
1995	3.29	2	7.0	Brook, cutthroat
1998^	1.34	5	23.0	Brook, cutthroat
1999	0.84	5	13.0	Cutthroat

* Opened to catch-and-release angling, closed 1980-1985
^ Data for both Ouzel Lake and Ouzel Creek

Ouzel Creek. Average catch rates have ranged from 1 to 3.4 fish per angler hour in the creek since 1987. One angler reported catching 15 greenbacks in 3 hours of fishing in 1992 and 2 anglers reported catching 23 fish in 7 hours of fishing in the lake in 1995. In 1998, 5 anglers fishing in the creek and lake reported catching 1.34 fish per hour with 52% of their catch being brook trout. Catch rates prior to the restoration averaged 0.72 fish/hour, while they averaged 2.21 fish/hour after the restoration.

Summary of Creel Survey Data, Ouzel Creek, 1960-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1960	2.50	2	8.0	Brook
1961	0.61	11	62.0	Brook, cutthroat
1963	0.25	20	80.0	Brook
1964	0.52	11	140.0	Brook, cutthroat
1966	1.50	1	2.0	Brook
1969	3.88	6	17.0	Cutthroat
1976	6.00	1	0.5	Brook
1980	Exotic species removed			
1986*	no data collected			
1987	1.40	3	19.0	Cutthroat
1988	2.60	3	36.0	Cutthroat
1990	1.90	9	27.0	Cutthroat, brook
1992	3.40	5	18.0	Cutthroat, brook
1997	3.00	4	12.0	Cutthroat, brook, rainbow
1998^	1.34	5	23.0	Brook, cutthroat

* Opened to catch-and-release angling, closed 1980-1985

^ Data for both Ouzel Lake and Ouzel Creek

Map Oz. 1. Location of Ouzel Lake and Creek Restoration Habitat, and Location of Antimycin Treatment Sites, 1980.

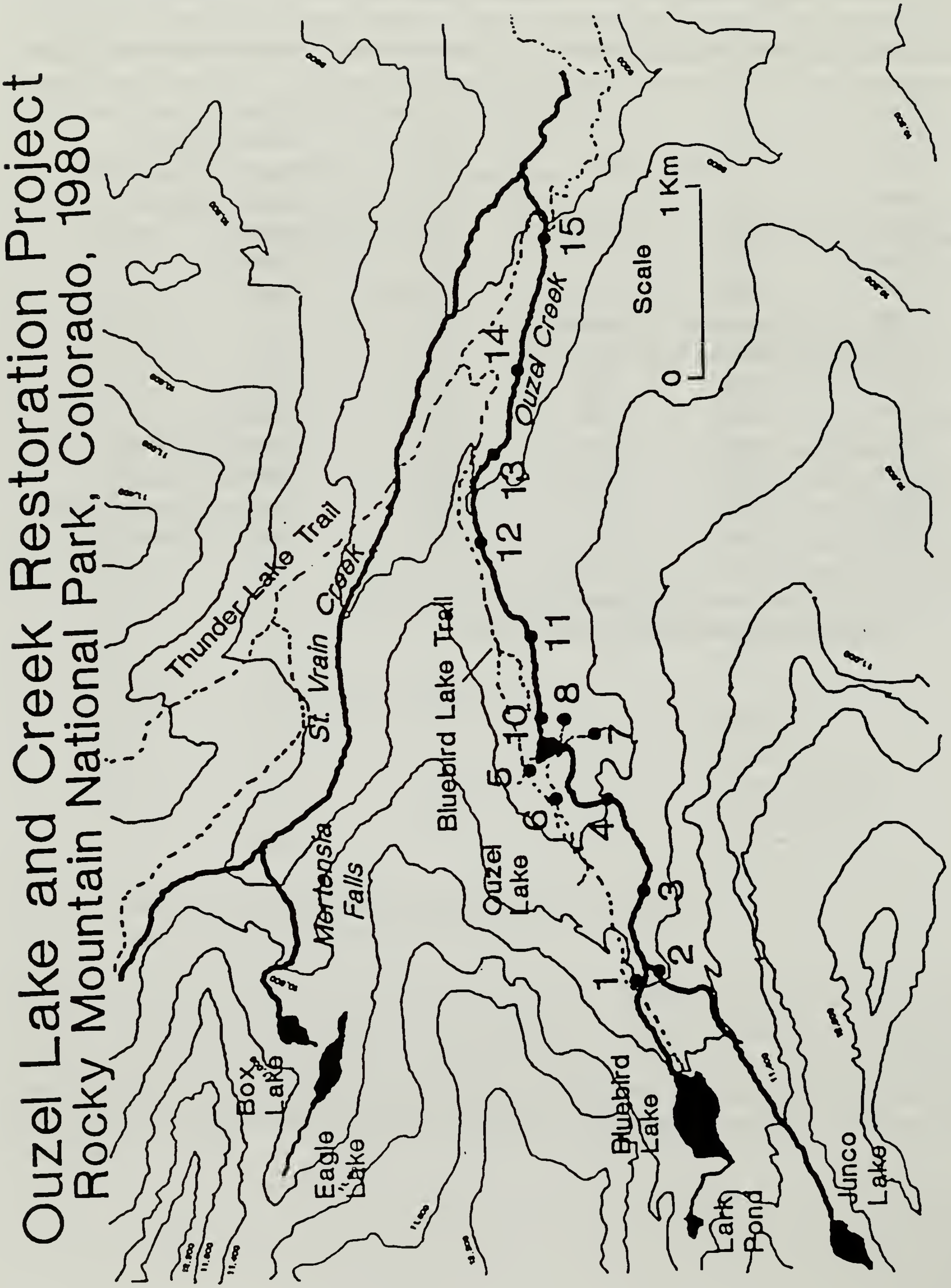


Table Oz. 1 Amounts of Antimycin and Rotenone Applied to Ouzel Lake and Ouzel Creek, 12 August 1980.

Site Number (Map. Oz. 1)	**CFS or ACF**	**Ug/l Ant. or Rotenone**	**Time**	**MLS Ant. or Rotenone**	**Temp**
1. Bluebird trail xing	5.6 CFS	8.3 ug/l A	5 H	255 A	6.6C
		1.0 mg/l R	1 H	1100 R	
2. Junco/Ouzel Cr. Jct	11.4 CFS	8.1 ug/l A	5 H	470 A	
		1.0 mg/l R	1 H	1100 R	
3. 10,400'	11.4 CFS	8.1 ug/l A	5 H	470 A	
		1.0 mg/l R	1 H	1100 R	
4. Main Inlet @ 10,200'	11.4 CFS	8.0 ug/l A	8 H	800 A	8-13C
5. Inlet 1-2	<0.1 CFS		8 H	107 A	5C
6. Inlet 3	0.8 CFS		8 H	247 A	8C
7. Inlet 5	1.1 CFS		8 H	150 A	4C
8. Inlet 6	0.2 CFS		8 H	107 A	5C
9. Ouzel Lake	16.0 ACF	9.8 ug/l with inlets	slug	940 A 8 -	14C
10. Ouzel Outlet	13.4 CFS	8.7 ug/l	8 H	940 A	
11. 9920'	13.4 CFS	4.0 ug/l	8 H	470 A	
12. 9820'	15.5 CFS	3.7 ug/l	8 H	470 A	
13. 9760'	15.5 CFS	3.7 ug/l	8 H	470 A	
14. 9640'	15.5 CFS	3.7 ug/l	8 H	470 A	
15. Ouzel Falls	15.5 CFS	1.0 mg/ Kmn04	11 H		

A = Antimycin
R = Rotenone

First dead fish appeared at 1100 at Ouzel Lake and 1315 at site 12.

In addition to the above antimycin, one unit of antimycin was sprayed to the swampy area upstream from the inlet of Ouzel lake. Another unit of antimycin and 0.5 unit of antimycin sand was sprayed to the swampy area between sites 12 and 13 on 12 August. On 13 August another unit of antimycin was sprayed between sites 12 and 13.

Fern Lake and Creek

Fern Lake is located in the headwaters of the Big Thompson River drainage at an elevation of 2,895 m (9,498 ft). Fern Lake is 3.7 ha, with a maximum depth of 9.1 m. Fern Creek flows 1.4 km from Fern Lake to Fern Falls, with August flows of 0.20 to 0.32 cms.

Brook trout and a few hybridized cutthroats were removed from Fern Lake and Fern Creek upstream of Fern Falls on 2 September 1982 with antimycin (Rosenlund and Stevens 1989). Fern Lake was restocked with 12,137 greenbacks and Fern Creek with 2,432 greenbacks 27 to 44 mm in length. Annual lake stocking rates ranged from 135 fish/ha to 1800 fish/ha, with a total of 3,280 fish/ha stocked over a three year period. Stocking at this rate produced greenbacks to 220 mm in two years, compared to five years to produce 220 mm greenbacks in Ouzel Lake at a total stocking rate of 5,184 fish/ha over three years.

Fern Creek was stocked at an annual rate of 415 fish/km to 785 fish/km, with a total of 1737 fish/km

Fern Lake

stocked in three years. Fern Creek was not surveyed in 1984, but greenbacks to 230 mm were present in Fern Creek by 18 September 1985.

Gill netting of the lake and electrofishing of the entire length of the stream above Fern Falls produced no brook trout, 1982 through 1985.

Based upon gill net data, the stocking of 12,317 greenbacks 29 mm to 44 mm in length from 1982 to 1985, appears to have produced greenback numbers and weight that exceeded the previous brook trout population by 1985.

Males captured in 1984 and 1985 were running milt in the fall. Females captured in September 1985, contained eggs ready for spawning in 1986, with spent greenback females captured 21 July 1986. Young-of-year greeenbacks were easily captured in the inlet by 17 September 1987.

The average length of greenbacks declined from 1984 to 1985 due to the influence of the fish stocked in 1983 starting to enter the nets. Fern Lake was not gill netted in 1986, but greenbacks to 247 mm in length were taken by angling, 21 July 1986.

Gill net surveys conducted from 1990 to 1993 produced catch rates from 3.5 greenbacks/net hour to 17 greenbacks/net hour (Rosenlund et al. 1994). In 1991 and 1993 two surveys were conducted with catch rates lower for the second net survey conducted in the fall.

Current Population Status

Fern Lake. The last gill net surveys conducted at Fern Lake were in 1993. On 25 June a gill net set caught 4 greenbacks in a 15 minute net set. These fish ranged in size from 242 mm to 270 mm, with two males running milt, one female spent, and one female about a week from spawning. Another survey conducted on 12 October caught 7 greenbacks in one hour. These fish ranged in size from 237 mm to 293 mm, with all fish in good condition.

In 1998, spawning was first observed in the outlet on 29 June. The peak of the outlet spawning run occured around 8 July and ended before 22 July. As the spawning run went on smaller greenbacks were observed. Greenbacks were first observed in the inlet on 7 July at a temperature of 7C. The inlet run peaked around 15 July and ended shortly after 22 July.

Summary of Gill Net Sampling, Fern Lake, Mid-Lake Trend Site, 1975-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/28/75*	Brook	198.00	127-368	1.6	0.17
10/12/84*	Greenback	215.83	190-231	0.8	0.08
09/18/85	Greenback	164.68	97 -226	4.4	0.21

09/17/87	Greenback	210.50	175-223	1.6	0.22
10/12/90	Greenback	242.42	228-265	3.5	0.45
07/09/91	Greenback	246.21	210-280	10.5	1.51
09/26/91	Greenback	225.14	165-292	7.0	0.81
07/09/92	Greenback	244.31	163-299	17.0	2.15
06/25/93	Greenback	251.50	242-270	16.0	2.28
10/12/93	Greenback	256.85	237-293	7.0	0.84

* Overnight net set

Fern Creek. An electrofishing survey conducted above Fern Falls in 1988 estimated the creek to contain 11.33 greenbacks/100' and 23.37 kg/ha with greenbacks ranging in size from 45 mm to 215 mm. In 1991, another survey was conducted in the same area. This survey estimated that there were 6.84 greenbacks/100' with a density of 24.19 kg/ha of fish greater than 100 mm. Young of the year were found to be abundant in 1991.

Fern Creek above Fern Falls was included in the *Minimum Habitat Requirements For Establishing Translocated Cutthroat Trout Populations* study (Harig and Faysch 2000), see Special Studies and Projects section, page 9. Fern Creek was assigned a population status of high, with 25 greenbacks/km observed in pools based on surveys conducted in 1996. Using Harig and Fausch's stream-scale model for predicting translocation success, the habitat in Fern Creek has a 5.3% chance of becoming barren, a 38.1% chance of supporting low numbers of cutthroats and a 56.6% chance of supporting high numbers of cutthroats. Habitat variables used to calculate these probabilities were: 7.7° C mean daily July water temperature; 4.5 m mean bankfull pool width and 56 pools with a residual depth ≥ 30 cm. The watershed area for Fern Creek was estimated at 6.8 km^2

Angler Use

Fern Lake. When populated with brook trout, volunteer creel survey reported anglers catching 0.74 brook trout per hour, from 1958 to 1976 under catch-and-kill regulations. Since 1986 when Fern Lake opened to catch-and-release angling for greenbacks catch rates have averaged 3.02 greenbacks/angler hour.

In 1986 rangers and FWS personnel interviewed 47 anglers who had expended 63 hours fishing at Fern Lake on 14 days, 15 June to 12 September. Anglers landed an average of 2.4 greenbacks/hour, with 33% of the greenbacks landed 200 to 250 mm in length. No anglers were found who had kept any greenbacks. Average catch rates have ranged from 0.2 to 6 greenbacks per angler hour since 1987, with anglers reporting catching 2.33 greenbacks/angler hour in 1998.

Summary of Creel Survey Data, Fern Lake, 1958-1999

Year	**Fish/Hour**	**# Anglers**	**Total Hours**	**Species Reported Caught**
1958	0.85	no data	no data	no data

1961	0.32	14	149.0	Brook, rainbow
1962	0.18	13	120.0	Brook, rainbow, cutthroat
1963	0.05	10	20.0	Brook
1964	1.15	23	161.0	Brook, cutthroat, rainbow
1965	0.70	41	188.0	Brook, rainbow, cutthroat
1966	0.40	18	150.0	Brook
1967	0.78	19	55.0	Brook, cutthroat, rainbow
1968	1.34	24	129.0	Brook, rainbow, cutthroat
1969	0.96	43	132.0	Brook, rainbow, cutthroat
1972	3.33	3	6.0	Brook
1973	0.40	4	10.0	Brook
1974	0.33	2	3.0	Brook
1976	1.38	10	21.0	Brook, rainbow, brown
1982	Exotic species removed			
1986*	2.44	47	63.0	Cutthroat
1987	5.48	10	13.5	Cutthroat
1988	4.40	8	14.5	Cutthroat
1989	6.00	7	7.0	Cutthroat
1990	6.00	1	1.0	Cutthroat
1992	4.20	6	10.0	Cutthroat
1994	2.00	2	2.0	Cutthroat
1996	6.10	5	9.8	Cutthroat
1998	2.33	10	34.8	Cutthroat
1999	0.20	2	20.0	Cutthroat

* Opened to catch-and-release angling, closed 1982-1985

Fern Creek. Limited creel data exists for Fern Creek.

Summary of Creel Survey Data, Fern Creek, 1976-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1976	0.63	9	12.8	Brook
1982	Exotic species removed			
1986*	no data collected			
1989	4.00	1	2.0	Cutthroat

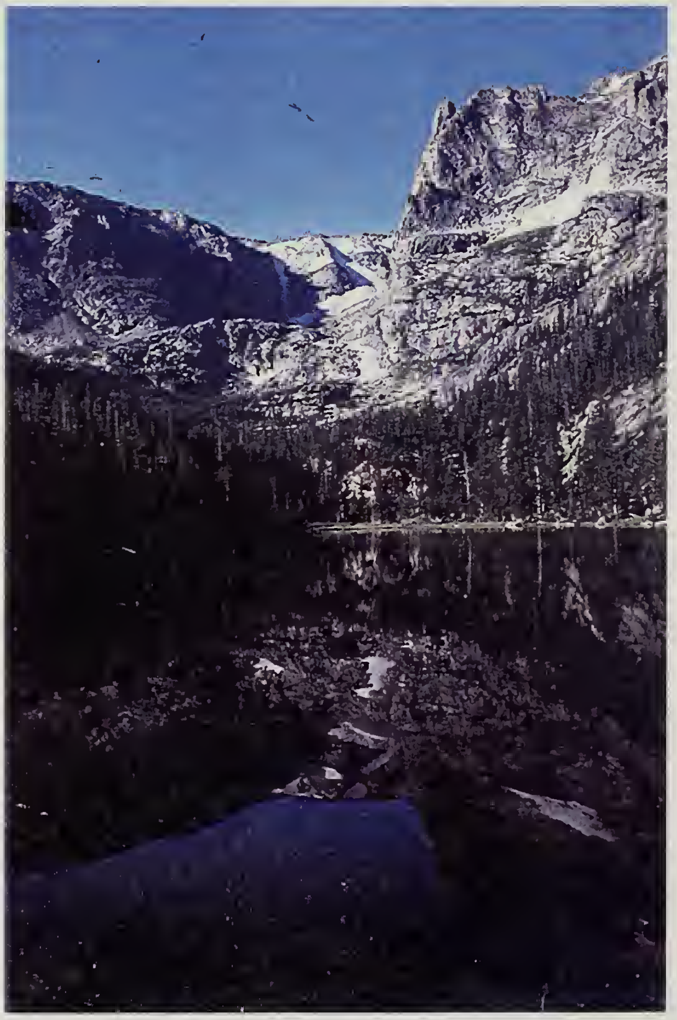
* Opened to catch-and-release angling, closed 1982-1985

Odessa Lake

Odessa Lake (4.5ha) is located upstream of Fern Lake at an elevation of 3,048 m (10,000 ft). In the 1920's and 1930's it was stocked with brook and rainbow trout. From 1939 until 1968, when the stocking of nonnative fish ceased in RMNP, cutthroat trout were stocked into Odessa Lake. A 15 hour gill net survey in 1980 did not catch any fish (Rosenlund and Stevens 1989). At that time the lake was believed to be barren.

The lake was stocked with 1,120, 27 mm greenbacks in 1984, and 1,100, 27 mm greenbacks in 1985, for an annual stocking rate of 247 fish/ha as part of an experimental stocking to determine if greenbacks could survive in this lake. The final experimental stocking of Odessa Lake was in September 1989, with 4,000 greenbacks stocked.

When sampled in 1986, Odessa greenbacks ranged from 110 mm to 230mm in length. The biggest



Odessa Lake

surprise of the Odessa Lake netting was the destruction of the gill net in mid-water, and consumption of many of the fish in the net by what appears to have been an otter. Otters were introduced into the Colorado River within RMNP, and are now reported to be in Forest Canyon to the north of Odessa Lake.

An electrofishing survey of the outlet stream on 26 September 1991 turned up several small fish and fry. At this time it was determined that reproduction was occurring and Odessa Lake was considered a stable population. Males running milt and spent females were collected in 1991, 1992 and 1993.

Current Population Status

The most recent net surveys indicate that the population is currently in good condition with good catch rates and a wide size range of greenbacks present since 1993. A gill net survey in 1998 caught 10 greenbacks in a one hour set. These fish ranged in size from 174 mm to 330 mm.

A small spawning run was observed in both the outlet and the west inlet in 1998. Fish were first observed in the outlet on 8 July with the peak of the run occurring on that date. The end of the run occurred shortly after 22 July. Fish were first observed in the west inlet on 15 July, with this serving as the peak. Like the outlet, the inlet spawning run ended shortly after 22 July.

Summary of Gill Net Sampling, Odessa Lake, Outlet Trend Site, 1975-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/28/75*	Cutthroat	231.14	no data	0.1	no data
08/28/75*	Cutthroat x Rainbow	402.59	323-439	0.2	no data
07/21/80*	No fish caught in a 15 hour set				
07/22/86	Greenback	181.00	115-285	0.4 +	0.02+
09/17/87	Greenback	254.00	253-257	1.5	0.38
07/09/91	Greenback	270.71	216-306	5.3	1.06
09/26/91	Greenback	211.80	155-330	3.3	0.35
07/09/92	Greenback	219.50	169-305	3.2	0.32
06/25/93	Greenback	272.00	199-340	11.5	2.26
10/12/93	No fish caught in an 80 minute set				
08/28/98	Greenback	271.90	174-330	10.0	2.40

* Two nets set overnight
+ Otter ate some fish and others lost trying to untangle net

Angler Use

In 1987, Odessa Lake was opened to catch-and-release angling with one angler interviewed. That angler caught 3 greenbacks in 1 hour. Creel survey data collected from 1960 through 1969 showed anglers catching 0.18 fish per angler hour. Since the stocking of greenbacks the catch rates have been 1.45 greenbacks/angler hour. In 1998, one angler reported catching 5 greenbacks in two hours of fishing.

Summary of Creel Survey Data, Odessa Lake, 1960-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1960	0.33	2	6.0	Rainbow
1963	0	2	1.0	
1964	0.11	10	65.0	Cutthroat, rainbow
1965	0	4	8.0	
1967	0	2	3.0	
1968	0	2	8.0	
1969	0.48	14	31.0	Brook
1987*	3.00	1	1.0	Cutthroat
1998	2.50	1	2.0	Cutthroat
1999	1.00	1	8.0	Cutthroat

* Opened to catch-and-release angling, closed 1984-1986

Lawn Lake and the Roaring River

Lawn Lake is located at the head of the Fall River drainage and is the highest lake at the head of the Roaring River to sustain annual fish reproduction. Following the failure of the Lawn Lake Dam on 15 July 1982, Lawn Lake was reduced to 9.5 ha, and a maximum depth of 8.5 meters.

In 1983, brook trout were removed from Lawn lake and 6.5 km of the Roaring River upstream of Horseshoe Falls with antimycin and rotenone, Map Ln 1 and Table Ln 1 (Rosenlund and Stevens 1989). From 1984 through 1986, Lawn Lake was stocked with 26,329 greenbacks 29 mm to 44 mm in length. Annual greenback stocking rate was 924 fish/ha, with a total of 2,771 fish/ha stocked 1984 through 1986.

The Roaring River below Lawn Lake has been stocked with 15,700 greenbacks 27 mm to 44 mm in length in from 1984 to 1987.

Lawn Lake. Gill netting on 28 July 1986 probably only sampled greenbacks originating from the 29 mm greenbacks stocked in September 1984. Numbers of greenbacks caught per net hour was similar to the previous brook trout population by 1984, and kg/net hour exceeded the 1979 brook trout population by 1988.

The inlet of Lawn Lake within 500 m of the lake was sampled with no fish found in September 1986. The entire length of the inlet was sampled in 1987 and 1988, with only a few adult greenbacks found

Lawn Lake

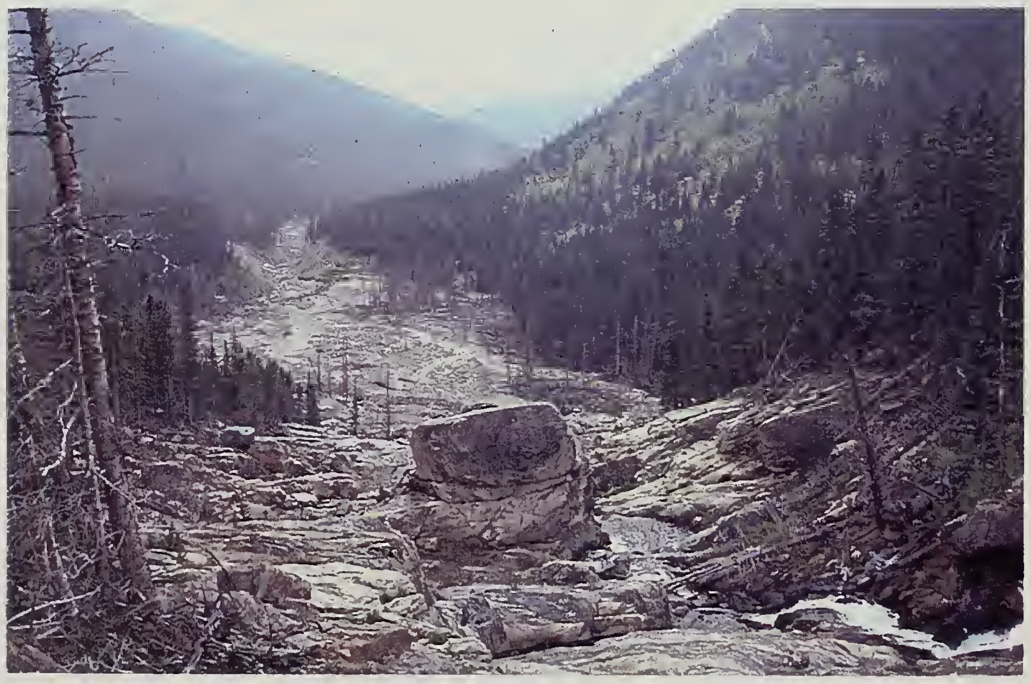
throughout the inlet stream. By 1989, adult and YOY were abundant in the outlet, but still only a few adult greenbacks and no YOY greenbacks were present throughout the inlet to Lawn Lake. By 1991 YOY were found to be abundant in the inlet.

Greenbacks were found to be spawning by 10 July 1992 at an outlet temperature of 10° C, with abundant fry in the inlet in September 1992. Spawning appeared delayed in 1993 due to the cold winter of 1992-93, with no spawning fish observed on 10 July 1993 (Rosenlund et al. 1994). No fry were observed in the inlet or outlet on 25 September 1993.

Approximately 100 m downstream of the dam, a barrier exists to fish migration, with several adult greenbacks found below this barrier that have appeared to have migrated out of Lawn Lake to spawn, but were unable to return. To maximize spawning habitat above this barrier, the old outlet pipe should be removed, and the outlet made as natural as possible. This work is scheduled to be done in 2000.

Since the last stocking in 1987, average fish lengths have increased while catch rates have decreased based on gill net survey data.

Roaring River. The failure of the Lawn Lake Dam destroyed the Roaring River, removing riparian vegetation and leaving bedrock and silt. Some brook trout were found to remain immediately below Lawn Lake, and to one km downstream of the dam and were removed as part of the Lawn Lake renovation project in 1983.



Roaring River

Although the Roaring River had been drastically changed by the flood, the Roaring River was stocked in 1984, 1985, 1986 and 1987 with a total of 15,700 greenbacks into the flatter sections of the 6.5 km of the Roaring River.

While stocking in September 1986, the Roaring River 300 m upstream of the trail to the Ypsilon Campground was sampled. Six cutthroats were collected that ranged from YOY at 20 mm to mature adults at 264 mm. By 18 October 1988, greenbacks ranged from 80 mm to 305 mm, with a greenback population of 31 fish/100 m of stream found just upstream of the Ypsilon Creek junction.

A gill net survey was conducted at Lawn Lake in 1992 with 8 greenbacks caught in an 85 minute set. The males were ripe and the females were gravid. The size range was from 235 mm to 280 mm. Two of these fish had hook torn jaws.

Current Population Status

Lawn Lake. The last gill net survey was conducted in 1996, with two nets set across the oulet. Each net fished for 55 minutes, with a total of 25 greenbacks averaging 280 mm. These greenbacks were over a size range of 178 mm to 385 mm. Net surveys conducted prior to 1996 showed a decrease in catch rate each time the lake was surveyed. The catch rate of 13.7 greenbacks/net hour was the highest since 1988.

Summary of Gill Net Sampling, Lawn Lake, Outlet Trend Site, 1971-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/14/71~	Brook	233.00	101-302	3.1	no data
07/29/82*	Brook	233.89	142-335	7.53	1.02
08/22/83	Brook	223.81	135-304	no data	no data
07/28/86	Greenback	143.00	120-160	3.6	0.11
09/16/87	Greenback	223.00	200-254	2.7	0.35
07/20/88	Greenback	215.00	176-252	20.0	2.16
09/05/89	Greenback	235.00	202-270	12.3	2.34
07/15/91	Greenback	240.31	205-295	10.1	1.49
07/10/92	Greenback	251.50	235-280	6.4	1.10
09/05/96^	Greenback	280.44	178-385	13.7	3.13

~ 3 nets set overnight
* Overnight net set
^ 2 nets set

Roaring River. An electrofishing survey was conducted above the Ypsilon Lake trail bridge in 1991. The population was found to be 14.4 greenbacks/100' and 81.3 kg/ha with many fish missed due to high water flows. The same trend site was surveyed in 1989 and the population was found to contain 37.3 greenbacks/100'. Greenbacks ranged in size from 73 mm to 273 mm. In 1991 larger fish were found in pools while smaller fish were in swift areas.

In 1989, an electrofishing survey was also conducted at the bridge to the Ypsilon Creek campsite. At this trend site greenbacks were found to be 18.5 fish/100' and 65.8 kg/ha. The population estimate for this section was 31 fish/100' in 1988. Greenbacks ranged in size from 73 mm to 259 mm, with YOY were present in side pools. Based on these electrofishing surveys the Roaring River greenback population is in excellent condition. No brook trout were found at either trend site.

The Roaring River was included in the *Minimum Habitat Requirements For Establishing Translocated Cutthroat Trout Populations* (Harig and Fausch 2000), see Special Studies and Projects section, page 9, with habitat surveys conducted in 1997. From these surveys 18 greenbacks/km were observed in pools. However, this study only takes into account fish observed in pools. Based on electrofishing surveys most fish are found outside of pools. The Roaring River also had one of the lowest pool densities, 11.7 pools/km, of any stream included in the study. Taking into account the electrofishing data it was assigned a status rating of high. Using Harig and Fausch's stream-scale model for predicting translocation success, the habitat in the Roaring River has a 0.8% chance of becoming barren, a 9.1% chance of supporting low numbers of cutthroats and a 90.1% chance of supporting high numbers of cutthroats. Habitat variables used to calculate these probabilities were: 9.9° C mean daily July water temperature; 4.9 m mean bankfull pool width and 21 pools with a residual depth $\geq$ 30 cm. The watershed area of the Roaring River was estimated at 14.6 km^2.

An electrofishing survey was conducted on the Roaring River below Horseshoe falls in 1998. Greenbacks were found to be the second most abundant species in this section, with 1.7 fish/100' sampled and a density of 9.96 kg/ha. These fish are believed to have dropped down from above Horseshoe Falls since no greenback YOY were captured or observed. The greenbacks ranged in size from 103 mm to 260 mm for an average of 163 mm. Brook trout were the dominant species in this section, with brown and rainbow trout also present. The organism responsible for whirling disease, *Myxobolus cerebralis*, was also found in this section, with no fish showing any clinical signs of the disease.

Angler Use

Lawn Lake. Lawn Lake opened to catch-and-release angling in 1988 with anglers reporting catching an average of 3.2 greenbacks per hour. Since 1989, anglers reported catching between 0.72 and 6 greenbacks per angler hour at Lawn Lake. Pre-restoration catch rates averaged 1.0 fish/angler hour from 1958 to 1976. Catch rates since the restoration have averaged 2.24 greenbacks/angler hour.

Summary of Creel Survey Data, Lawn Lake, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught

1958	1.15	no data	1,379.0	Brook, rainbow, cutthroat
1959	1.39	no data	1,784.0	Brook, cutthroat
1960	0.66	8	47.0	Brook, cutthroat
1961	0.49	85	635.0	Brook, rainbow
1962	0.56	57	370.0	Brook
1963	0.76	18	136.0	Brook
1964	0.54	101	1,026.0	Brook, cutthroat, rainbow
1965	1.21	47	181.0	Brook
1966	1.44	19	78.0	Brook, cutthroat
1967	1.21	74	219.0	Brook, cutthroat, rainbow
1968	1.39	41	109.0	Brook, cutthroat, brown, rainbow
1969	0.70	75	606.0	Brook, cutthroat
1972	1.85	15	26.0	Brook
1973	0.82	8	11.0	Brook, cutthroat
1974	4.21	3	14.0	Brook, cutthroat
1976	2.87	17	43.5	Brook
1983	Exotic species removed			
1988*	3.20	12	8.5	Cutthroat
1989	6.00	18	15.0	Cutthroat
1990	1.90	15	15.0	Cutthroat
1992	4.00	2	2.0	Cutthroat
1994	0.72	7	12.5	Cutthroat, brook
1996	4.37	3	8.0	Cutthroat, brown
1998	1.28	9	36.5	Cutthroat, rainbow
1999	0.74	5	17.5	Cutthroat

* Opened to catch-and-release angling, closed 1983-1987

Roaring River. The Roaring River was opened to catch-and-release angling in 1991 with no creel survey data collected that year. In 1992 anglers reported catching 15.6 greenbacks per angler hour. Average catch rates since 1993 have ranged from 0.57 to 10 greenbacks per angler hour. Based on information collected from anglers, experienced anglers who know how to fish the Roaring River can catch up to 40 fish/hour. The Roaring River is considered one of the best fisheries in RMNP, with many guides bringing their clients here. Although anglers have reported catching brook, brown and rainbow trout, none of these species have been collected in electrofishing surveys at trend sites located at the most popular fishing locations. The presence of species other than greenbacks in the creel survey data could be explained by misidentification by the angler or anglers fishing below the greenback restoration project. Catch rates prior to its restoration to greenback cutthroat trout have averaged 0.9 fish/hour. After the restoration catch rates have averaged 3.9 fish/hour.

Summary of Creel Survey Data, Roaring River, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	2.50	no data	no data	no data
1962	0.28	5	25.0	Brook, cutthroat
1963	1.26	10	34.0	Brook
1964	1.46	4	13.0	Brook, cutthroat
1966	0.80	5	10.0	Brook
1969	3.25	2	4.0	Brook, cutthroat
1975	1.67	2	6.0	Brook
1976	0.69	10	36.1	Brook, rainbow, brown
1983	Exotic species removed			
1991*	no data collected			
1992	15.60	3	5.0	Cutthroat
1993	10.00	6	12.3	Cutthroat, brook, brown
1994	3.19	24	48.0	Cutthroat, brook, brown, rainbow
1995	0.57	5	7.0	Cutthroat, rainbow, brook
1996	3.00	6	10.0	Cutthroat
1998	4.07	31	112.8	Cutthroat
1999	1.42	14	35.0	Cutthroat, rainbow, brook

* Opened to catch-and-release angling, closed 1983-1990

Map Ln 1. Location of Lawn Lake and Roaring River Restoration Habitat, and Antimycin Treatment Sites, 1983.

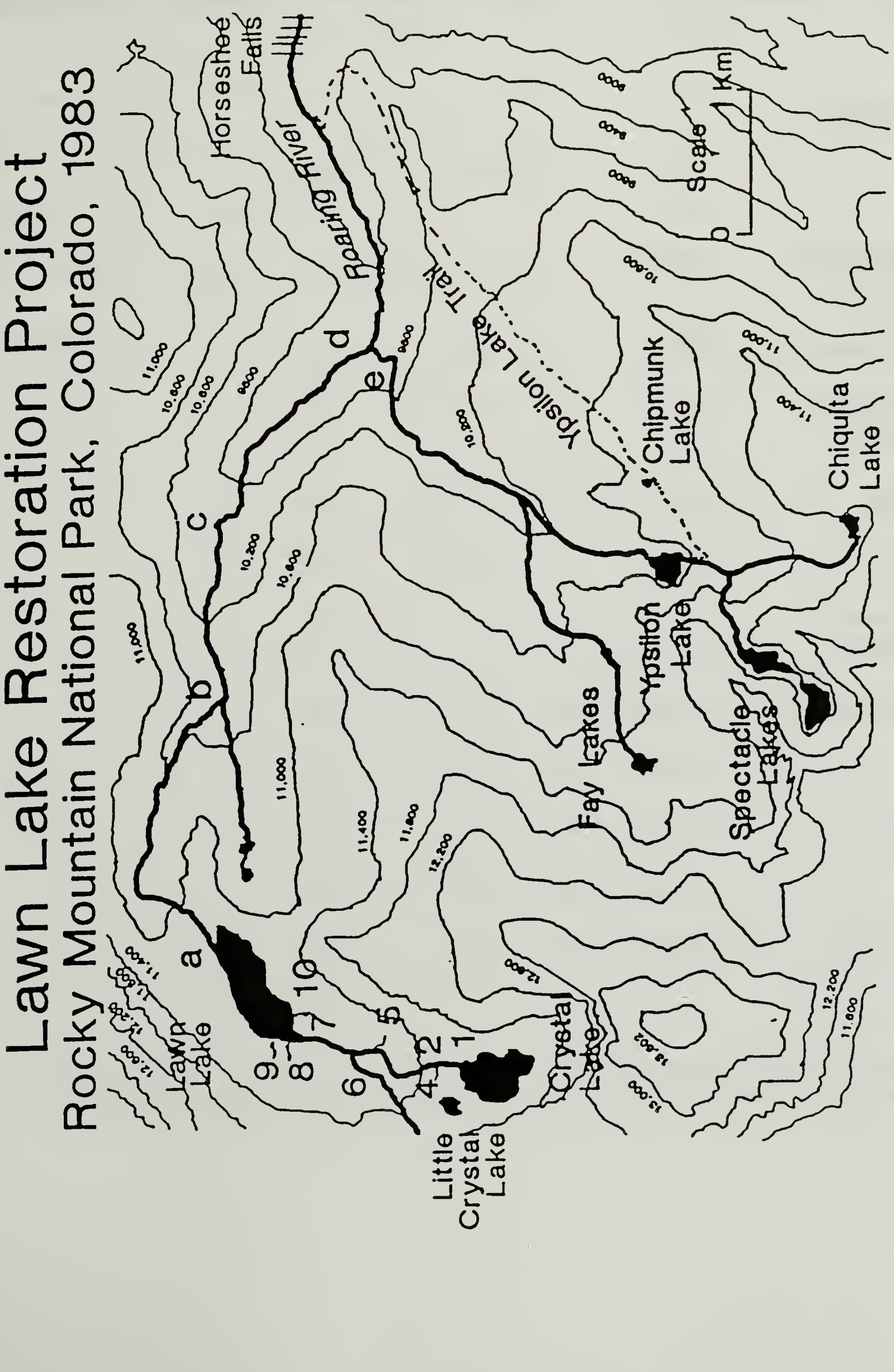


Table Ln 1. Amount and Location of Antimycin to Lawn Lake, and Rotenone to the Roaring River, 1983.

Lawn Lake

Site	CFS or ACF	Ug/l	Time	Units Antimycin
1. Outlet Big Crystal	6.0 CFS	5.0	10 H	1.0
2&3. Beaver Pond	10.0 CFS	10.0	10 H	2.0
4&4.'Outlet Lt. Crystal	7.4 CFS	8.0	10 H	1.25
5. Bog	0.4 CFS		10 H	0.20
6&6.'	1.0 CFS		10 H	0.20
Spray to sites 1 through 6				1.0
7. Old waterline	12.0 CFS	14.6	16 H	6.0
8.	~1.0 CFS	10.0	10.0	0.2
9.	~1.0 CFS	10.0	10.0	0.2
10.	~1.0 CFS	10.0	10.0	0.2
Lawn Lake*	360.0 ACF	3.25	slug	31.0
Total				43.0 Units

* of the 31 units to Lawn Lake, four sprayed around shore, 23 applied by injection into the propwash of an electric boat motor and four pumped into the deepest part of the lake.

Roaring River

Site	CFS	mg/l Rotenone	Time	mls Rotenone
A. Outlet Lawn L.	7.23	2.0	2 H	1892
B. Jct	13.0	0.69	2 H	1892
C. 9,990'	13.0	0.69	2 H	1892
D. > Y Creek	13.0	0.69	2 H	1892
E. < Y Creek	23.0		2 H	2838

Lower Hutcheson Lake and Cony Creek

The Hutcheson Lakes of Rocky Mountain National Park consist of seven lakes and ponds located in four cirques at the head of Cony Creek, and isolated from the North St. Vrain drainage by Calypso Cascades.

Following the discovery of the Hunters Creek greenbacks in 1985, taxonomic samples were collected from Upper Hutcheson Lake in 1986. Examination of the samples by Dr. Behnke (1986), CSU, concluded that the Upper Hutcheson lake fish were pure greenbacks:

"Based on 27 specimens, the cutthroat trout population found in Upper Hutcheson Lake is identified as pure greenback cutthroat trout, Salmo clarki stomias. I assume this population is derived from an early transplant from the St. Vrain River drainage. This sample is more "extreme" in their taxonomic characters than the 1985 sample from Hunter's Creek. This may be due to the "founders effect" as no evidence of a hybrid influence was detected."

The Hutcheson Lakes downstream from Upper Hutcheson Lake were managed by the Colorado Division of Wildlife through 1980. Lower Hutcheson was stocked with rainbow trout and contained a population of greenback x rainbow hybrids in 1986. Middle Hutcheson Lake contained a pure greenback population based upon the examination of specimens by Dr. Behnke.

Based upon the findings of Dr. Behnke and the goals of Greenback Cutthroat Trout Recovery Plan,

Lower Hutcheson Lake

cutthroat hybrids were removed from Lower Hutcheson Lake downstream to a barrier just upstream from the junction of the outlet of Pear Lake and Cony Creek 9 September 1987, Map Hut. 1 and Table Hut. 1 (Rosenlund and Stevens 1989).

Following treatment of Lower Hutcheson and Cony Creek, all fish that could be observed were collected and measured. A total of 65 cutthroat hybrids were found in Cony Creek from the outlet of Lower Hutcheson to the KMn04 station. The cutthroats ranged in length from 30 mm to 330 mm, with 54% of these fish exceeding 210 mm.

Fish recovery was difficult in Lower Hutcheson, due to the depth of the lake, with only 46 fish ranging from 190 mm to 498 mm recovered.

Lower Hutcheson was not stocked with greenback fry in 1988. In 1989, 1,340 greenbacks 161 mm in length were stocked in June and 1,700 fry were stocked in September 1989. The stream below Lower Hutcheson Lake was stocked with 1,500 fry in September 1989. The final stocking of the lake occurred on 25 September 1991 when 1,600 greenback fry were stocked.

Lower Hutcheson was stocked at the highest rate per hectare during the 1989 stocking of 161 mm greenbacks, and the fish grew well through September 1989 (210 mm). However, this lake produced the lowest number of fish per net hour (3.0) by over a factor of 10, compared to other lakes stocked with the 161 mm greenbacks in 1989. Salmon eggs and fish heads were observed near the inlet in September 1989, and indicated that the lake was subject to angler harvest.

Greenbacks were observed spawning in the inlet, but not in the outlet, in early July 1991. A gill net survey conducted at the same time caught 6 greenbacks in a one hour set.

A hook-and-line survey conducted by a Colorado Division of Wildlife employee on 13 July 1997 caught 6 greenbacks in 2 hours of angling. These fish ranged in size from 260 mm to 320 mm and all were in great condition. Two of these fish were females, with one running eggs and the other was spent. Greenbacks were observed to be spawning in the inlet with none observed in the outlet.

Current Population Status

Lower Hutcheson Lake. Lower Hutcheson Lake was surveyed on 10 August 1998, with 10 greenbacks caught in a 45 minute gill net set. The catch rate of 13.3 greenbacks/net hour is similar to Upper and Middle Hutcheson Lakes which were also surveyed in 1998. This catch rate was more than double the previous survey conducted in 1991, however the 1998 survey was conducted in thunderstorms which has been observed to produce greater catch rates than calm weather. These fish averaged 298 mm with a size range of 222 mm to 350 mm. All fish were in good condition.

Summary of Gill Net Sampling, Lower Hutcheson Lake, Inlet Trend Site, 1981-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/30/81*	Rainbow	247.81	210-261	0.3	0.04
07/30/81*	Cutthroat	214.98	178-280	0.3	0.02
07/24/86*	Cutthroat x Rainbow	266.38	161-373	1.6	0.39
09/29/89	Greenback	210.00	175-245	3.0	0.24
07/02/91	Greenback	303.33	255-330	6.0	1.78
08/10/98	Greenback	298.30	222-350	13.3	3.96

* Overnight net set

Cony Creek. As part of the *Minimum Habitat Requirements For Establishing Translocated Cutthroat Trout Populations* study (Harig and Fausch 2000), see Special Studies and Projects section, page 9, Cony Creek from the barrier above Pear Creek to Lower Hutcheson Lake was surveyed in 1998. This section contained 26.9 greenbacks/km observed in pools. For the final report this section of Cony Creek and section from Calypso Cascades to Pear Creek, which was surveyed in 1996, were combined and a population status of high was assigned to all of Cony Creek above Calypso Cascades. Using Harig and Fausch's stream-scale model for predicting translocation success, the habitat in Cony Creek has a 0.1% chance of becoming barren, a 1.3% chance of supporting low numbers of cutthroats and a 98.6% chance of supporting high numbers of cutthroats. Habitat variables used to calculate these probabilities were: 9.0° C mean daily July water temperature; 5.4 m mean bankfull pool width and 146 pools with a residual depth ≥ 30 cm. The watershed area for Cony Creek above Calypso Cascades was estimated at 14.5 km^2.

Angler Use

Lower Hutcheson Lake opened to catch-and-release fishing in 1991, making the entire Hutcheson Lakes series open to angling. Limited creel survey data is available for this lake. The data which is available suggests the same as gill net surveys and observations, that the greenback population is low.

Summary of Creel Survey Data, Lower Hutcheson Lake, 1987-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1987	Exotic species removed			
1991*	no data collected			
1993^	5.21	5	30.3	Cutthroat
1995	2.00	2	2.0	Cutthroat
1997	0.50	2	6.0	Cutthroat

* Opened to catch-and-release angling, closed 1987-1990
^ Anglers reported their location as Hutcheson Lakes

Cony Creek. For information regarding angler use on Cony Creek see the Pear Lake and Cony Creek section following this section.

Map Hut 1. Location of Cony Creek and Hutcheson Lake Restoration Sites, and Antimycin Treatment Sites, 1987.

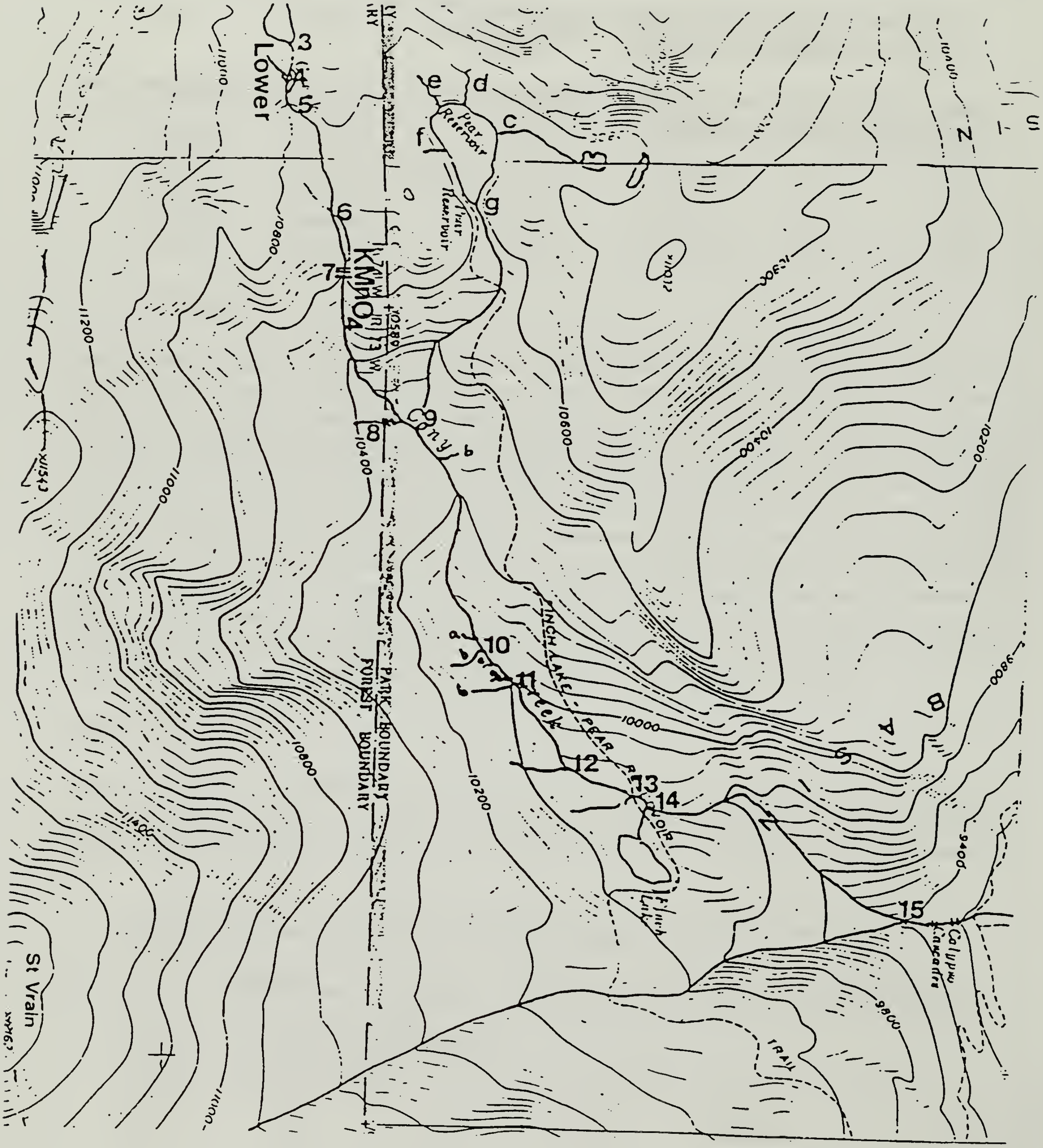


Table Hut 1. Amount and Location of Antimycin Applied to Lower Hutcheson Lake and Cony Creek, September 1987.

Site	Flow/ ACF	Ug/l Antimycin	Time	Units Antimycin
2. Inlet L. Hut.	2.0 CFS		8 H	1.5
L. Hutch. Lake	65 ACF	3 ug/l*	slug	5.0
3. Outlet L. Hut.	2.4 CFS	8 ug/l	8 H	0.33
4. Side Stream	<0.1 CFS		8 H	0.08
5. 7 - Kmn04	2.4 CFS	1.5 mg/l	10 H	

* including 1.5 units applied to the inlet, total dosage to lake = 3.84 ug/l

Pear Lake and Cony Creek

Pear Lake is located at an elevation of 3,225 m (10,581 ft), and was a natural lake that was expanded by the addition of a stone and concrete dam. Due to the impacts of the dam, no vegetation existed around the reservoir to the high water line, and natural fish reproduction was limited due to water fluctuations and limited spawning habitat.

Following the problems with Lawn Lake, the dam was acquired by RMNP. Starting in June 1988, the dam was removed and the outlet stream reconstructed by August 1988. Even without the dam, Pear Lake is 6.07 ha (15 ac), and one of the deepest lakes (up to 15 m) in RMNP.

Pear Reservoir was populated by a modest population of rainbow x greenback hybrids, due to the limited spawning habitat. Removal of the dam increased outlet spawning habitat, and removed fluctuating water problems that limited spawning when the dam was present. As part of the greenback recovery program, Pear Lake was scheduled for renovation following removal of the dam. In addition to Pear Lake, hybrids were also removed from Cony Creek downstream to Calypso Cascades, Map Pear 1, and Table Pear 1 (Rosenlund and Stevens 1989).

Days before the Pear Lake and Cony Creek project was to begin, rotenone from a Colorado Division of Wildlife project caused major downstream impacts on the Arkansas River, and resulted in cancellation of all CDOW Fish Control Permits. However, due to Pear Lake's location within RMNP, and the use of antimycin, the project was allowed to continue under everyone's nervous eye.

The renovation project began 7 September 1988, with Pear Lake (460 acf) treated with 24 units (2 ug/l) of antimycin by 1530. With a surface temperature of 10C, most fish were heavily impacted within 10 hours, and all appeared dead within 19 hours. Of the 24 units applied to the lake, four were applied through the inlet streams and 20 were applied to the surface of the lake by raft and venturi pump on an outboard motor. High winds and meter high waves resulted in excellent mixing within a short amount of time. To contain the antimycin to Pear Lake, and reduce the flow on Cony Creek, the outlet flow (0.7 CFS) was blocked with sandbags for four weeks.

Cony Creek was also treated on 7 September 1988, with antimycin applied for eight hours starting at 0700. Eight treatment stations were located along Cony Creek (mostly at junctions with small side streams) and were activated as a dye marker reached the $KMnO_4$ station by 1130. The $KMnO_4$ station operated for 12 hours, and although treated with 1.5 mg/l of $KMnO_4$, the red color of potassium permanganate was not visible at the Ouzel Lake trail crossing.

Fish were dead in the upper and lower reaches of Cony Creek by the next morning, but moribund fish were still present between site 10a and 11b by 1230. To insure a complete kill in this section, 16 ug/l of antimycin was applied for 2.45 hours at site 10a, and the $KMnO_4$ station reactivated for four hours, Table Pear 1.

Below the Finch Lake trail crossing, Cony Creek is steep and forms numerous barriers to fish migration, with the detoxification station located just above Calypso Cascades to insure no impact downstream. However, due to a loss of over 158 m (520') of elevation from the Finch Lake bridge to Calypso Cascades, it was unlikely the antimycin would remain active all the way to the detoxification station. Block nets set in the stream to prevent drift of fish indicates that the antimycin was only toxic for about 50% of the distance between Finch Bridge and the KMnO4 station, with live fish observed just above the KMnO4 station.

Pear Lake was stocked with 3,164 greenbacks at 161 mm in length on 30 June 1989, 5,000 fry in September 1989 and 1,500 greenback fry in October 1990. Cony Creek was stocked, from the outlet of Pear Lake to Calypso Cascades, with 7,000 fry on 14 September 1989 and 1,500 fry on 11 October 1990.

The outlet stream reconstructed in 1988, is developing well, with spawning substrate and nursery areas present by September 1989.

A removal population estimate of Pear Lake was attempted by Mr. Rip Shively, Colorado State University, prior to treatment. Due to an insufficient number of fish captured (69), the removal estimate was cancelled and a marked number of fish from Cony Creek were stocked into Pear Lake. Following treatment of Pear Lake, the ratio of marked to unmarked fish was used to calculate the fish population, with total fish biomass of 96.3 kg and 16.64 kg/ha estimated to be present in 1988 (Shively 1989b).

On 21 August 1988, a two-pass population estimate of Cony Creek was conducted, with 31 fish/100 m of stream found just downstream of the Finch Bridge, and 13 fish/100 m of stream found above the bridge. During the renovation project, block nets were used to prevent drift downstream, with all visible fish removed and measured within 24 hours of the treatment. A total of 542 fish were recovered, over a range of 30 mm to 362 mm in length.

Current Population Status

Pear Lake. A gill net survey conducted in 1998 caught 8 greenbacks in a 65 minute net set. The survey was conducted on a sunny day and fish were observed turning away from the net as they approached it. The catch rate of 7.4 fish/net hour was significantly lower than the previous survey conducted in 1989 which caught 46 greenbacks in an hour net set. However, Pear Lake was stocked twice in 1989 prior to that survey.

Summary of Gill Net Sampling, Pear Lake, Outlet Trend Site, 1963-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/15/63*	Cutthroat	187.80	102-356	1.1	no data
07/29/81*	Cutthroat x Rainbow	225.52	159-277	1.5	0.17

08/26/87*	Cutthroat x Rainbow	282.50	242-302	0.3	0.09
09/29/89	Greenback	208.00	177-248	46.0	2.74
08/11/98	Greenback	237.00	209-280	7.4	0.99

* Overnight net set

Cony Creek. Cony Creek, from Calypso Cascades to Pear Creek, was surveyed in 1996 as part of the *Minimum Habitat Requirements For Establishing Translocated Cutthroat Trout Populations* study (Harig and Fausch 2000), see Special Studies and Projects section, page 9. Twenty-two fish per kilometer were observed in pools in through this section. For the final report this section and the section above Pear Creek, which was surveyed in 1998, were combined and a population status of high was assigned to all of Cony Creek above Calypso Cascades. Using Harig and Fausch's stream-scale model for predicting translocation success, the habitat in Cony Creek has a 0.1% chance of becoming barren, a 1.3% chance of supporting low numbers of cutthroats and a 98.6% chance of supporting high numbers of cutthroats. Habitat variables used to calculate these probabilities were: 9.0° C mean daily July water temperature; 5.4 m mean bankfull pool width and 146 pools with a residual depth ≥ 30 cm. The watershed area for Cony Creek above Calypso Cascades was estimated at 14.5 km^2.

Angler Use

Pear Lake. There are several campsites near the lake giving evidence of heavy visitation. Pear Lake opened to catch-and-release angling for greenbacks in 1991 with one angler, who caught 4 greenbacks in one hour of angling, interviewed. In addition to information collected from creel survey cards, one RMNP ranger reported that he and a friend caught 100 greenbacks in 10 hours of fishing in 1996. In another report in 1997, 3 anglers fishing for 5 hours each caught 40-50 greenbacks each. Both of these parties reported the greenbacks they caught ranged in size from 150 mm to 330 mm. Catch rates prior to the restoration averaged 0.73 fish/angler hour, while catch rates after the restoration have averaged 3.97 greenbacks/angler hour.

Summary of Creel Survey Data, Pear Lake, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	0.44	no data	568.2	Cutthroat, rainbow
1959	0.65	no data	340.0	Cutthroat, rainbow
1960	0.75	9	44.0	Cutthroat
1961	1.33	4	12.0	Cutthroat
1962	0.81	10	57.0	Cutthroat
1963	0.75	6	24.0	Cutthroat
1964	0.55	22	127.0	Cutthroat
1965	1.03	7	79.0	Cutthroat, brook
1966	0.79	48	235.0	Cutthroat, brook, rainbow,

				brown
1967	1.38	20	82.0	Cutthroat, brook
1968	4.00	11	10.0	Cutthroat, brown
1969	1.01	31	146.0	Cutthroat, rainbow, brown
1974	0.59	12	83.0	Cutthroat, brook, rainbow, brook
1976	0.42	4	24.0	Cutthroat
1985	1.27	10	54.0	Cutthroat, rainbow
1986	3.18	2	11.0	Cutthroat, brook
1988	Exotic species removed			
1991*	4.00	1	1.0	Cutthroat
1992	6.00	30	5.0	Brook, rainbow
1995	3.46	3	13.0	Cutthroat
1997	no data	1	no data	Cutthroat (one fish caught)
1998	3.61	4	10.5	Cutthroat

* Opened to catch-and-release angling, closed 1988-1990

Cony Creek. Cony Creek above Calypso Cascades opened to catch-and-release angling in 1991. In most instances anglers do not identify where on a stream they are fishing even though creel survey cards ask for this information. Because of this, creel survey data for Cony Creek cannot be broken down into sections.

Catch rates prior to the restoration above Pear Creek averaged 1.67 fish/hour while catch rates after the reopening of all of Cony Creek in 1991 have averaged 5.05 fish/hour.

Summary of Creel Survey Data, Cony Creek, 1960-1999^

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1960	2.09	22	64.0	Brook, rainbow, cutthroat
1961	0.67	4	48.0	Brook, rainbow
1962	0.40	10	10.0	Rainbow
1963	1.81	21	86.0	Cutthroat, rainbow, brook
1964	0.85	2	20.0	Brook
1966	0.54	6	13.0	Rainbow, cutthroat, brook
1967	0.50	2	16.0	Rainbow, cutthroat, brown
1969	2.86	14	28.0	Cutthroat, rainbow, brook
1976	0.80	5	25.0	Cutthroat
1985	2.91	3	12.0	Cutthroat
1986	4.07	9	26.0	Cutthroat, brook, rainbow, brown
1987	Exotic species removed Pear Creek to above of Lower Hutcheson Lake			

1988	2.00	2	2.0	Cutthroat
1988	Exotic species removed from Calypso Cascades to Pear Creek			
1991*	15.00	1	4.0	Cutthroat
1992	7.50	30	4.0	Brook, cutthroat
1995	1.88	2	16.0	Cutthroat
1997	4.66	3	6.0	Cutthroat
1998	12.00	1	0.5	Cutthroat

^ Data is for all sections of Cony Creek

* Opened to catch-and-release angling above Calypso Cascades

Map Pear 1. Location of Pear Lake and Cony Creek Restoration Habitat, and Antimycin Treatment Sites, RMNP, September 1988.

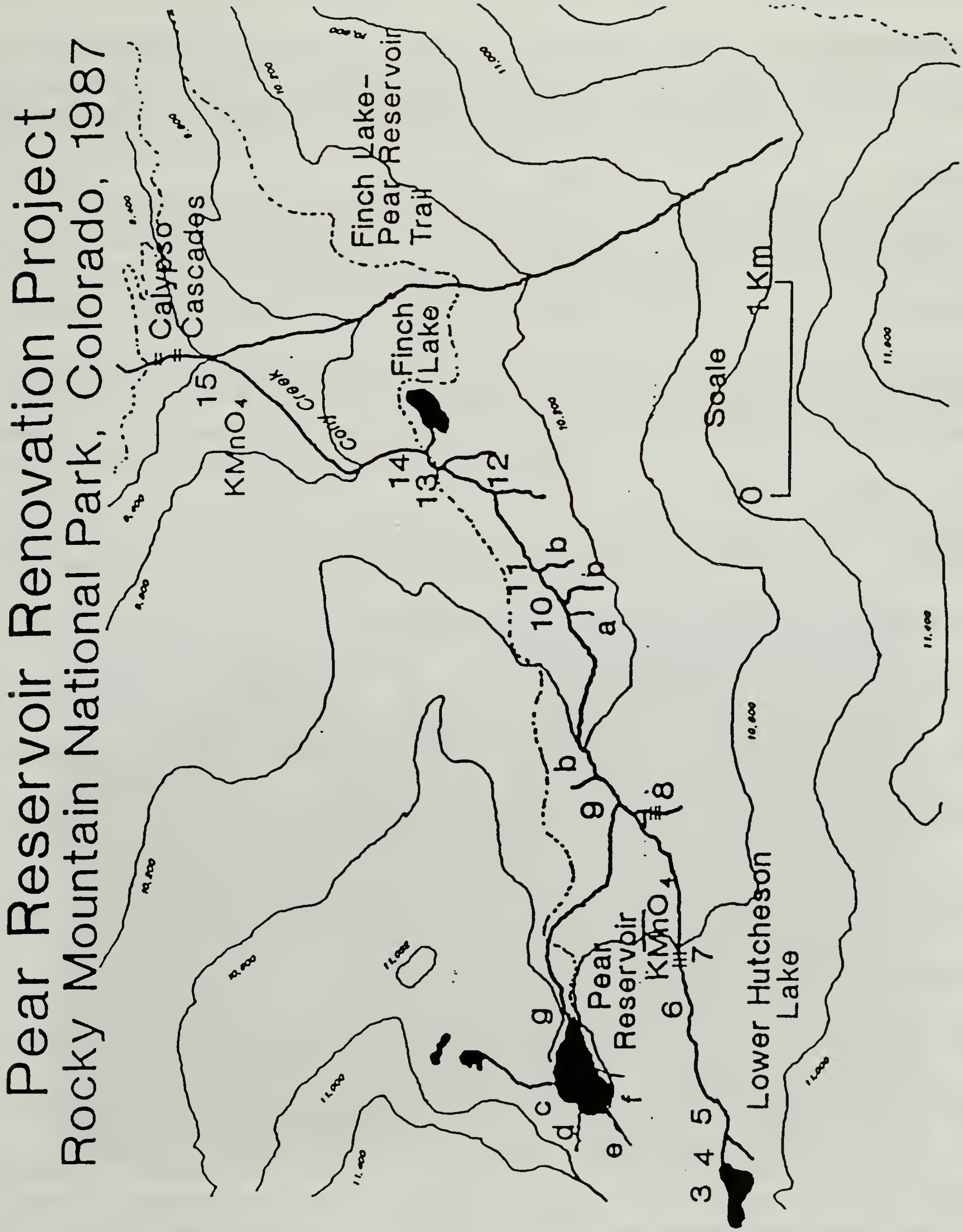


Table Pear 1. Amount of Antimycin and KmnO4 applied to Pear Lake and Cony Creek, RMNP 1988.

Site	CFS	ACF	ug/l	Time	Total Antimycin
6 September 1988					
Pear Lake		460			20 units
Pear Inlet C		0.07		8	1 unit
Pear Inlet D		0.60		8	1 unit
Pear Inlet E		0.53		8	1 unit
Cony 7, 10,699'	2.8	1.85	8	8	176 mls
Cony 8, 10,280'	2.8		3	8	65 mls
Cony 9a	2.8		3	8	64 mls
Cony 10a*			0.4	8	10 mls
Cony 10b			0.4	8	10 mls
Cony 11a, 10,200'	2.8		4	8	88 mls
Finch Bridge**	2.8		0.4	8	10 mls
			------	----	----------
KmnO4	2.8		1.5(ppm)	12	5.1 kilo
7 September 1988					
Cony 10a	2.8		16	2.75	123 mls
KmnO4	2.8		1.5(ppm)	4.0	1.7 kilo

*, **. These applications were conservative to prevent any downstream impacts. Considering the amount of elevation loss, could have treated at 4 to 6 ug/l at these sites. Because of the low dosage on 6 September, the area below 10a was retreated on 7 September. Moral of story, if in under the gun, go light and treat again if necessary.

Sandbeach Lake

Sandbeach Creek is a tributary of the North St. Vrain Creek, and is isolated from the main flow of the North St. Vrain by a large barrier approximately 2 km downstream of the lake, Map Sand. 1.

Sandbeach Lake was a natural lake at the head of Sandbeach Creek that was enlarged with a dam prior to the creation of RMNP. Following the Lawn Lake incident, the dam on Sandbeach Lake was purchased by RMNP, with the dam removed and the outlet stream reconstructed in 1988. Without the dam, Sandbeach is 4.0 ha (9.9 ac), with a maximum depth of 7.6 m (25').

Prior to removing the dam, trout spawning habitat was extremely limited. Inlet spawning habitat was limited, and any outlet spawning habitat was covered by the dam. Rainbow trout have existed in the relatively warm reservoir for at least 20 years, but without stocking and good spawning habitat, the rainbow trout population was very low (0.14 fish/net hour) by 1988.

Work on the dam and outlet stream, combined with low inlet flows during 1988, resulted in the reservoir having no outlet flow during September 1988. To take advantage of the outlet flow situation, it was proposed that the small rainbow trout population in Sandbeach Lake be removed as soon as possible, and the lake converted to greenbacks.

On 21 September 1988, Sandbeach (130 ACF) was treated with 7 units of antimycin applied by venturi on an outboard motor, and 1.5 units applied by constant flow to the inlet over an eight hour

Sandbeach Lake

period (Rosenlund and Stevens 1989). With a surface temperature of 10° C, moribund and dead rainbows to 350 mm were present within 7 hours. However rainbows to 500 mm were still moribund within 15 hours of treatment, and an additional 2 units of antmycin was applied on the snowy morning of 22 September. With a total of 10.5 units of antimycin applied to Sandbeach Lake within 15 hours, the total dosage was 3.15 ug/l of antimycin.

Although 20 to 30 rainbow trout at 350 mm to 500 mm in length were observed dying, only two rainbow were recovered from the bank. In addition to rainbow trout, a few longnose suckers were recovered from the lake. Following the treatment, leaches were observed to be heavily impacted by the antimycin treatment.

No live or moribund fish were observed 24 hours after treatment, and no fish were caught in net sets overnight in October 1988. No outflow of Sandbeach Lake occurred through September 1988, and there were no downstream impacts due to the use of antimycin.

Spawning substrate is present in the outlet spawning channel constructed in 1988. However, the outlet spawning channel has not completely sealed, with over-ground water flows covering only 60% of the outlet area.

Due to the cold temperatures of the inlet, and barriers to fish migration into the inlet, spawning within the inlet stream above the lake is not possible. However, rainbows were observed in spawning activity in the alluvial fan formed by the inlet entering the lake. In this area, spawning substrate is maintained, with the warm water of the lake allowing for hatching of eggs. However, considering the number of rainbows that remained within the lake, this spawning area was not very successful.

Additional good greenback habitat exists in a hanging valley below Sandbeach Lake, and should be renovated in the future as part of the Sandbeach project.

Sandbeach Lake was stocked with 1,862 greenbacks at 161 mm in length on 30 June 1989, and with 4,000 greenback fry on 14 September 1989.

The greenbacks stocked in June 1989 were found to 265 mm by September of 1989. Catch rates for Sandbeach Lake peaked in 1990, when 54 greenbacks were caught in a half hour net set. Greenbacks were observed spawning in both the outlet and at the alluvial fan at the inlet.

Greenbacks were reported spawning in the outlet and at the alluvial fan in 1991. A visual inspection of the lake in August of 1991 found the area were fish were spawning in the spring dry. A few rises were observed but other than that there were no fish observed in the lake. YOY were abundant in the outlet and outlet cove. Skinny greenbacks and abundant YOY were observed in the hanging valley below the barrier on Sandbeach Creek as well as below another barrier at the head of a meadow. A 125 minute gill net set at the inlet in September did not catch any fish. An outlet net set caught 13 greenbacks in 2 hours. This catch rate, 7.5 fish/net hour, was down significantly from the previous year. Another gill net survey conducted in 1993 obtained similar results to the 1991 survey.

Twenty-five percent of the greenbacks surveyed in 1993 had damage to their jaws due to catch-and-release fishing.

Current Population Status

In 1998, gill net surveys were conducted at the inlet and outlet. No fish were caught in a one hour net set at the inlet. Three greenbacks were caught in two nets set for a total of two hours at the outlet. These fish averaged 327 mm with a size range of 276 mm to 353 mm. Fry were abundant in the outlet stream with 6 100 mm to 150 mm greenbacks also present. Fry were also observed in the hanging valley below Sandbeach Lake.

Spawning in 1998 was first observed in the outlet on 16 June. The outlet stream was still partially covered by snow but the water temperature was 9° C. This run peaked around 25 June and ended shortly after 6 July. Greenbacks were observed at the alluvial fan on only one visit on 6 July. On that date three males, one 250 mm and two at about 365 mm, and one 365 mm female were present. The smaller male had what appeared to be bite marks on its back and the larger males were acting aggressively toward it.

Although flows through Sandbeach Creek are low in the fall, two areas were found to contain what look to be good specimens of greenbacks. Both areas are in beaver pond habitat, with one located above a steep canyon wall and the other located below the wall. At the time of the Sandbeach Lake restoration Sandbeach Creek was believed to contain a hybrid cutthroat population.

Tissue samples were collected from both areas in 1999 and taken to Don Proebstel for genetic analysis to determine if these fish are the original hybrids or pure greenbacks that have dropped out of Sandbeach Lake. The samples collected above the wall were determined to be A- greenback cutthroat trout with a slight Yellowstone cutthroat trout influence and evidence of multiple sources. The fish below the wall were determined to be B+ greenback cutthroat trout with a Yellowstone cutthroat trout influence and evidence of multiple sources. Based on Don's analysis of the samples it appears that pure greenbacks are dropping out of Sandbeach Lake and mixing with the hybrids that were originally present.

Summary of Gill Net Sampling, Sandbeach Lake, Outlet Trend Site, 1964-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
06/30/64*^	Rainbow	273.05	165-381	0.5	no data
07/16/80*	Rainbow	334.71	207-438	0.6	0.23
08/22/88*	Rainbow	412.00	368-457	0.1	0.04
09/14/89	Greenback	229.00	185-265	44.0	6.10
06/26/90	Greenback	243.00	205-295	108.0	15.20
09/25/91	Greenback	249.23	210-290	7.5	1.09

08/12/93	Greenback	266.62	235-305	8.0	1.58
09/28/98	Greenback	327.33	276-353	1.5	0.53

* Overnight net set
^ Net set in northwest corner

Angler Use

Reports from 1964 describe angler visitation to Sandbeach Lake as heavy with two campsites nearby. Angler success was poor despite stocking. Creel survey data is limited since the restoration, but the data which is available suggests that the greenback population is low. The average catch rate since the restoration is 0.39 fish/angler hour, while it was 0.81 fish/hour prior to the restoration. This is the only restoration area in RMNP where catch rates after the restoration are lower then before the restoration.

Summary of Creel Survey Data, Sandbeach Lake, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	1.19	no data	798.0	Rainbow, cutthroat
1959	0.71	no data	929.0	Rainbow
1960	0.25	4	8.0	Rainbow
1961	0.06	20	106.0	Cutthroat, rainbow
1962	0.22	7	76.0	Rainbow, cutthroat
1963	0.05	7	42.0	Rainbow, cutthroat
1964	1.16	21	128.0	Rainbow, cutthroat
1966	0.23	16	64.0	Rainbow, cutthroat, brook
1967	0	8	17.0	
1968	0.72	6	18.0	Cutthroat, rainbow
1969	0.09	18	47.0	Rainbow
1976	0	5	13.0	
1986	0	2	3.0	
1988	Exotic species removed			
1991*	no data collected			
1993	0.25	7	16.0	Cutthroat
1996	0	1	0.5	
1998	1.00	1	6.0	Cutthroat
1999	0.18	4	5.5	Cutthroat

* Opened to catch-and-release angling

Spruce Lake

Spruce Lake is a 1.4 hectare lake located at 2,947 m (9,670 ft) with a maximum depth of 1 m. Spruce, along with Loomis Lake represent the only waters within the Spruce Creek drainage known to support self sustaining populations of trout. Although the lake is very shallow, stream spawning habitat exists near the lake in both the inlet and the outlet.

Prior to Spruce Lake being restored to greenback cutthroat trout it contained a good population of rainbow trout. It appeared that the warm summer water temperatures in Spruce Lake inhibited the success of the fall spawning brook trout which inhabited Loomis Lake upstream of Spruce and allowed the spring spawning rainbows an advantage.

The importance temperature plays in the success of fish species was also observed below Spruce Lake in August of 1981, when the stream below Spruce Lake and Spruce Creek were surveyed. The outflow of Spruce Lake descends about 152 meters in 0.8 km to a junction with Spruce Creek. During the survey on 19 August 1981, the temperature of the outflow of Spruce Lake was observed to fall from 20° C at 2,926 m to 12° C at the junction with Spruce Creek at 2,774 m (9,101 ft) in elevation. A small cliff exists on the outlet of Spruce Lake at an elevation of 2,926 m (9,600 ft), with spring inlets below this point reducing the stream temperature. Interestingly, although rainbows exclusively inhabit the Spruce Lake outlet stream above 2,926 m, below the barrier only brook trout were observed in the cooler stream section.

On 10 September 1990, rainbow trout were removed from Spruce Lake and the creek upstream of the cliff barrier by use of antimycin. The lake was restocked with 1,000 pure greenback fingerlings on 25 September 1991 and 1,100 greenback fingerlings on 23 September 1992.

Greenbacks were observed in spawning activity on 25 June 1993. A gill net survey was conducted on 21 July 1993 with 21 greenbacks caught in a 30 minute net set. Females caught handled very poorly while the males were very strong. Males larger than 150 mm had milt, while one 250 mm female was spawned out.

Loomis Lake is currently an experimental greenback population. For further information see the Greenback Cutthroat Trout Experimental Introductions section, page 128.

Current Population Status

The last gill net survey was conducted in August 1995 with greenbacks averaging 253 mm in length over a size range of 239 mm to 260 mm. Young of the year were observed in the outlet in 1995. Due to the warm temperatures in Spruce Lake greenbacks spawn earlier than other lakes in the area. When visited on 6 June 1998 the spawning run was in full swing with about 75 greenbacks in the outlet stream. The run peaked around 29 June with nearly 100 greenbacks in the outlet and over 20 in the inlet, with the run ending shortly after 15 July. The greenback spawning run at Spruce Lake was the largest observed in RMNP in 1998. Fry were also found to be abundant in the outlet.

Summary of Gill Net Sampling, Spruce Lake, North Shore Trend Site, 1979-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/27/79*	Rainbow	222.84	124-340	1.3	0.16
09/11/90*	Rainbow	222.14	145-307	2.3	0.28
09/23/92	Greenback	203.00	203	1.0	0.15
07/21/93	Greenback	203.28	140-250	42.0	3.29
08/15/95	Greenback	253.16	239-260	14.6	2.58

* Overnight net set

Angler Use

Spruce Lake opened to catch-and-release angling in 1993 with no anglers being interviewed that year. In 1999, 3 anglers were interviewed and they reported catching 5.79 greenbacks per angler hour. Prior to restoration catch rates averaged 0.58 fish/angler hour, with catch rates averaging 3.97 greenbacks/angler hour since the restoration. Currently Spruce Lake is one of the best fisheries within RMNP with many guides bringing their clients here.

Summary of Creel Survey Data, Spruce Lake, 1960-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1960	3.08	4	13.0	Brook, rainbow
1961	0.55	4	20.0	Rainbow, brook
1962	0.53	5	40.0	Rainbow, brook
1964	0.25	2	12.0	Cutthroat, brook
1965	0.20	6	25.0	Brook, rainbow
1966	0.31	17	248.0	Rainbow, brook
1967	0.63	5	30.0	Rainbow, brook
1969	0.84	6	19.0	Rainbow, brook
1972	1.00	1	1.0	Rainbow
1973	0.33	6	60.0	Brook
1976	1.40	5	28.5	Rainbow, cutthroat
1984	0.33	2	3.0	Rainbow
1985	2.00	3	4.0	Rainbow, brook
1986	0.41	18	36.0	Rainbow, cutthroat
1987	1.62	9	18.5	Rainbow, cutthroat, brook
1988	2.50	8	7.5	Rainbow
1989	2.00	1	2.0	Rainbow

1990	Exotic species removed			
1993*	no data collected			
1996	6.00	1	2.5	Cutthroat
1998	3.37	14	43.3	Cutthroat
1999	5.79	3	14.5	Cutthroat

* Opened to catch-and-release angling, closed 1990-1992

Dream Lake

Dream Lake is a 2.2 hectare natural lake, with a maximum depth of 4.5 m, located on Tyndall Creek at an elevation of 3,024 m (9,922 ft). It is easily accessible by trail from the Bear Lake parking area and receives heavy day use during the summer months. Spawning habitat exists in both the inlet and outlet, but barriers above and below the lake limit it to 150 m of stream.

Between 1922 and 1968, Dream Lake was stocked with 19,000 brook trout, 39,000 rainbow trout and 78,000 cutthroat trout. A gill net survey in 1958 found no fish, and is was concluded that the last stocking of 2,000 cutthroats in 1955, had either not survived, or were all harvested. Following the stocking of 2,000 cutthroat fingerlings in 1959, cutthroats were present to 127 mm in length by July 1960.

Stocking of non-native fish ended in 1968, with only a single year class of fish captured in gill nets in 1971 (Rosenlund and Stevens 1989). A 1978 gill net survey captured no fish in 19 hours, indicating that the lake was once again fishless.

However, despite discouraging net results (even brook trout have appeared to have failed here), anglers reported catching cutthroat trout in Dream Lake through the 1980's under the new RMNP fishing regulations that allowed for the daily harvest of two cutthroat trout over 250 mm in length.

Dream Lake was re-netted in 1987, and revealed the best reproducing population of fish observed

Dream Lake

in Dream Lake since sampling began in 1958. Specimens were taken to Dr. Behnke (1988) for analysis. He concluded that they were hybridized with other subspecies of cutthroats.

The lake was first proposed for restoration in 1989, but due to problems with obtaining chemical permits the lake was not restored until 1996. On 8 November 1996, hybrid greenback cutthroat trout were removed from Dream Lake. The lake was restocked with 190 adult and 5 immature greenback cutthroat trout by helicopter from Upper Hutcheson Lake on 11 July 1997. The fish began feeding immediately upon entering Dream Lake.

Current Population Status

Gill nets set at the inlet and outlet on 15 June 1998 found greenbacks in good shape with males running milt and most females about a week any from spawning. However, no spawning activity was observed in 1998. In 1999, net surveys conducted at the 1998 sites caught 5.6 greenbacks/hour, compared to 13.3 in 1998. The average length of fish caught in 1999 was 61 mm larger than in 1998, 354 mm to 293 mm, with no fish under 330 mm. A few fish were observed exhibiting spawning behavior in the outlet stream, however no fry were observed in October.

Summary of Gill Net Sampling, Dream Lake, 1958-1999

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
1958	No fish caught				
07/14/71*^	Cutthroat	280.00	246-295	0.1	no data
07/17/78*#	No fish caught in a 19 hour set				
07/13/87*%	Cutthroat	277.00	166-349	0.7	0.20
06/15/98~	Greenback	293.90	253-320	13.3	3.53
06/18/99~	Greenback	354.50	330-394	5.6	3.19

* overnight net set
^ 2 nets set, locations unknown
# 1 net set at inlet
% 1 net set at outlet
~2 nets set, inlet and outlet

Angler Use

Due to its close proximity, only 1.1 miles, to the Bear Lake parking area Dream Lake receives heavy visitation. Dream Lake opened to catch-and-release angling in 1999. Two anglers, who averaged 2.5 greenbacks/hour were interviewed in 1999. In addition three volunteers assisting with nets surveys did not catch any fish in a total of six hours of fishing.

Summary of Creel Survey Data, Dream Lake, 1961-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1961	2.0	3	7.0	Brook
1964	0.5	2	2.0	Rainbow
1976	0	2	2.5	
1996	Exotic species removed			
1999*	2.5	2	2.0	Cutthroat

* Opened to catch-and-release angling, closed 1996-1998

GREENBACK CUTTHROAT TROUT EXPERIMENTAL INTRODUCTIONS

In some situations, lakes with marginal habitat occurred upstream of a desired restoration lake. To determine if Type A greenbacks could colonize these marginal habitats, as they have in the North Fork of the Big Thompson River, greenbacks were experimentally introduced into five of these lakes, Crystal Lake, Odessa Lake, Lake Husted, Lake Louise and Loomis Lake.

Odessa and Crytal Lakes were the first two lakes to have experimental introductions. Annual stocking rates of these lakes were low, 247 fish/ha for Odessa and 125 fish/ha for Crystal to gain more data on greenback stocking rates. Since the experimental introduction, greenback reproduction has been documented in Odessa Lake and the lake is now considered stable.

Crystal, Odessa Lakes and Lake Louise were considered barren at the time of their experimental introductions. Lake Husted and Loomis Lake had reproducing populations of brook trout prior to their renovation to greenbacks. Reproduction of greenbacks has not been documented in any of these lakes, except Odessa. All of these lakes are currently open to catch-and-release angling.

Another experimental introduction was made into Lily Lake in 1990. Lily is a low elevation artificial lake with no spawning habitat. It receives heavy visitation, including fishing pressure, due to its close proximity to Highway 7, which runs along the eastern edge of RMNP. This introduction was made to document how greenbacks respond to heavy angling pressure and to use the lake as a roadside educational area.

Crystal Lake

Crystal Lake (3,511m (11,520 ft) and 10.0ha) is the source for the Roaring River and is one of the deepest lakes, 38 m, in RMNP. It was the highest lake in RMNP which supported nonnative fish life up to 10 years past the end of the nonnative stocking program and is currently the highest lake in RMNP that contains fish.

In 1983, Crystal Lake was found to be fishless during the restoration project which included Lawn Lake and the Roaring River (Rosenlund and Stevens 1989). It was restocked with a total of 3,740 greenbacks, from September 1984 through 1986, at an average annual stocking rate of 125 fish/ha, compared to 923 fish/ha for Lawn Lake. The final experimental stocking of this area was in September 1989, with 10,000 greenback fry stocked. Reproduction of Type A greenbacks in Crystal Lake would help define the upper limits of greenback reproduction.

Gill netting 29 July 1986 produced larger fish in Crystal Lake (143 mm vs 153 mm and 29.5 g vs 37.6 g) for an average annual stocking rate of 125 fish/ha for Crystal Lake vs 923 fish/ha for Lawn Lake. However, by 20 July 1988, Lawn Lake greenbacks were larger (215 mm vs. 178 mm) than those in Crystal Lake. Both areas were stocked on the same dates.

Gill net surveys conducted since Crystal Lake was stocked with greenbacks has shown that the average size of greenbacks caught has increased every time the lake has been surveyed.

Crystal Lake

Current Population Status

A gill net survey conducted at the outlet trend site in 1998 caught two large, 396 mm and 400 mm, greenbacks in a 42 minute set. In an attempt to locate small greenbacks, several locations besides the outlet trend site were gill netted in 1998. No fish under 308 mm in length were found that would indicate that reproduction is occurring at Crystal Lake. The smallest fish caught in fishing surveys, and from creel survey data collected, in 1998 was 313 mm. In the fall of 1998, the outlet area where greenbacks are observed spawning in the spring was surveyed for the presence of fry. In three visits only three fry were observed. Deformities, such as shortened snouts, short opercles and deformed pectoral fins, were observed in 53% of the greenbacks examined in 1998.

Summary of Gill Net Sampling, Crystal Lake, Outlet Trend Site, 1964-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/14/64^	Cutthroat	345.98	114-496	1.0	no data
07/27/79*	Cutthroat	384.00	320-447	0.1	0.07
07/29/82*	Cutthroat	355.8	356	0.02	0.03
08/24/84*	No fish in a gill net set for six days				
07/29/86*	Greenback	153.00	120-160	0.4	0.02
07/20/88	No fish caught in a 2.8 hour set				
07/20/88*	Greenback	177.71	154-245	0.4	0.02
07/16/91	Greenback	259.00	70-360	5.3	1.51
09/24/92	Greenback	307.00	307	0.5	0.17
09/25/93	No fish caught in a 1.5 hour set				
08/24/98	Greenback	398.00	396-400	1.2	0.76

^ Data for two overnight net sets, one at outlet trend site and the other along east shore
* Overnight net set

Angler Use

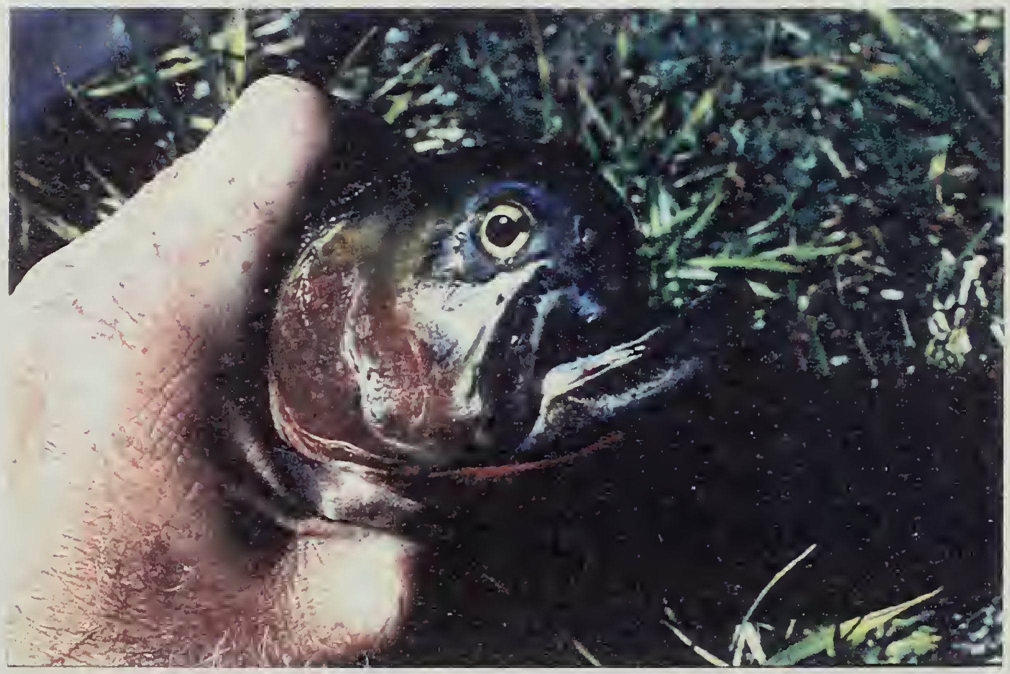
Reports from 1964 described angler visitation at Crystal Lake as moderate to heavy. Currently it receives little visitation. Crystal Lake opened to catch-and-release angling for greenbacks in 1990. Pre-restoration catch rates have averaged 0.5 fish/angler hour from 1959 through 1968, while catch rates since the restoration have averaged 1.03 greenbacks/angler hour.

Summary of Creel Survey Data, Crystal Lake, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	0.13	no data	no data	

1959	0.51	no data	686.3	Cutthroat
1960	0.08	5	24.0	Cutthroat
1962	0.31	3	16.0	Cutthroat
1963	0.29	4	7.0	Cutthroat
1964	0.17	6	18.0	Cutthroat
1965	0.38	3	8.0	Cutthroat
1966	1.50	2	4.0	Cutthroat
1967	0	3	2.0	
1968	0.93	3	15.0	Cutthroat
1983	Exotic species removed			
1990*	no data collected			
1995	1.00	1	5.0	Cutthroat
1996	1.00	1	1.0	Cutthroat
1998	1.05	4	8.5	Cutthroat

* Opened to catch-and-release angling, closed, closed 1983-1989



Genetic Deformity of Greenback From Crystal Lake

Lake Louise

Lake Louise (2.6 ha) lies within the North Fork of the Big Thompson River drainage at an elevation of 3,365 m (11,040 ft). It has a maximum depth of 5.5 m, with more than half of the lake near the outlet being shallow. Abundant spawning habitat exists at the outlet, however reproduction has not been documented.

Stocking records show one or more stockings of "black spotted" natives in the 1930's. A survey of the lake in 1958 (Bulkley) found it to be barren. Another survey in 1969 (Mullen) also found the lake to be barren, with no fish caught in a 20 hour gill net set.

In 1970, 50 greenback cutthroat trout from Como Creek were introduced into 1.7 km of the barren North Fork of the Big Thompson River below Lake Louise (Mullen 1970). A reproducing population of greenbacks was documented in the North Fork by 1978 (Rosenlund and Stevens 1989), with upstream migration into shallow ponds a few hundred feet below Lake Louise observed in 1984. One greenback collected from these shallow ponds was 393 mm in length with a condition factor (K) of 1.3.

Temperature seems to be the limiting factor to reproduction in Lake Louise. It is believed that fish spawn in the ponds below Lake Louise. These ponds are shallower and the water temperature is warmer, perhaps warm enough for long enough to get a successful spawn.

Lake Louise

Lake Louise was stocked with 3,500 greenback fry on 14 September 1989. A gill net survey in 1993 showed that the fish caught had spawning scars and the males were without milt.

Current Population Status

A few fish were observed spawning in the outlet in early July 1998, with an outlet temperature of 12° C at midday. The lake was gill netted 26 September 1998, with 9 greenbacks/net hour caught and averaging 265.14 mm with all fish within a narrow size range. The latest data would indicate that reproduction is not occurring in the lake. Deformities were observed in 3 fish, one had a deformed lower jaw and the other two had deformed pectoral fins.

Summary of Gill Net Sampling, Lake Louise, Outlet Trend Site, 1969-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
09/16/69	No fish caught in a 20 hour set				
08/25/93	Greenback	239.72	210-276	23.0	2.44
09/26/98	Greenback	265.14	255-273	9.0	1.35

Angler Use

Due to its remoteness, 11 miles from closest trailhead, it receives very little angler use. Lake Louise opened to catch-and-release angling in 1990.

Summary of Creel Survey Data, Lake Louise, 1976-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1976	0	2	1.0	
1990*	no data collected			
1999	12.0	1	0.5	Cutthroat

* Open to catch-and-release angling

Lake Husted

As part of a larger restoration project that included Lost Lake and the North Fork of the Big Thompson River below it, brook trout were removed from Lake Husted in 1986 (Rosenlund and Stevens 1989). The lake was treated 18 August with seven units of antimycin applied applied at a lake surface temperature of 17° C. All fish appeared dead within 13 hours, with a total of 288 brook trout recovered over a range of 81 to 300 mm. Based upon a Peterson population estimate (fish marked prior to treatment and recovered after treatment), the 1986 brook trout population of Lake Husted was estimated at 56.9 kg/ha by Colorado State University (Bergersen 1988).

Lake Husted was stocked with 2,000 greenback fry on 24 September l986 and 2,000 greenback fry on 16 September 1987.

By 1989 brook trout were once again found in Lake Husted. The lake was retreated on 5 September 1990 with 22% of the fish recovered after treatment being brook trout. The lake was restocked on 25 September 1991 with 4,000 greenbacks and again on 23 September 1992 with 3,000 greenbacks. A gill net survey in 1993 found greenbacks to 245 mm with no brook trout present.

Current Population Status

The lake was visited in early July 1998 and about 30 fish were observed spawning in the outlet. In September 1998 no water was flowing above ground through the outlet where the fish were observed in July. On 26 September 1998 gill net surveys were conducted at the inlet and outlet. The nets were

Lake Husted

set for a total of 74 minutes and caught 26 greenbacks, for a catch rate of 21.13 fish/net hour. However, fish were within a narrow size range. This information would indicate that reproduction is not occuring in Lake Husted. Examination of stomach contents of 4 fish found them all to be full and containing mostly plant material, with one greenback containing water boatman and a grasshopper. Two of the greenback caught had short opercles and one had a short peduncle.

Summary of Gill Net Sampling, Lake Husted, Outlet Trend Site, 1982-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/10/82*	Brook	250.00	150-304	2.7	0.43
09/07/89	No fish caught in a 2 hour set				
08/25/93	Greenback	205.05	155-245	20.0	1.61
09/26/98	Greenback	251.18	225-293	32.1	4.78

* 2 nets set overnight, one at outlet trend site and the other in south cove, data is for both nets

Summary of Gill Net Sampling, Lake Husted, Inlet Trend Site, 1989-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/09/89	Greenback	232.00	220-248	2.4	0.38
07/09/89	Brook	323.75	305-340	3.2	1.89
09/26/98	Greenback	248.37	234-267	12.9	1.58

Angler Use

Fishing pressure was described as quite light in 1961. Lake Husted opened to catch-and-release angling for greenbacks in 1995. A RMNP ranger reported catching 21 greenbacks in one hour of fishing in 1998 and a FWS volunteer fishing at the lake reported catching 5 greenbacks in 45 minutes in 1999. Catch rates prior to the restoration averaged 2.4 fish/angler hour from 1958 through 1984.

Summary of Creel Survey Data, Lake Husted. 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	3.77	no data	77.9	Brook
1960	3.08	no data	88.0	Brook
1961	1.42	no data	76.0	Brook, cutthroat, rainbow
1962	1.27	no data	66.0	Brook, cutthroat

1964	3.42	no data	36.0	Brook
1967	2.00	no data	5.0	Cutthroat
1984	0.87	2	8.0	Brook
1986	Exotic species removed			
1990	Exotic species removed again			
1995*	no data collected			
1998	21.00	1	1.0	Cutthroat
1999	6.66	1	0.8	Cutthroat

* Opened to catch-and-release angling, closed 1986-1994

Loomis Lake

Loomis Lake, along with Spruce Lake, represent the only waters in the Spruce Creek drainage that were known to support self sustaining populations of trout prior to their restoration to greenback cutthroat trout. It is located at an elevation of 3,115 m (10,220 ft), with a maximum depth measured at 4.87 m, and is 1.11 ha in size. Prior to its restoration, Loomis Lake contained a reproducing population of brook trout (Rosenlund and Stevens 1989). At the time of the restoration it was not believed that the lake could sustain a spring spawning species due to the lack of inlet and very limited outlet spawning habitat. Since it was upstrem of Spruce Lake, the main restoration lake, brook trout were removed from the lake on 9 September 1990 and restocked with 1,000 greenbacks on 25 September 1991 and 700 greenbacks on 23 September 1992. This was done as an experiment to see if greenbacks could survive in Loomis Lake.

A gill net survey conducted on 21 July 1993 caught 14 greenbacks in 45 minutes. The males were very ripe and females appeared to have spawned with no mature eggs inside their body cavity.

Loomis Lake

Current Population Status

The last gill net survey was conducted in 1995 with 13 greenbacks, averaging 211 mm in length, caught in one hour. These fish were over a size range of 179 mm to 242 mm. Greenbacks were first observed on 29 June spawning below a cascade at the outlet to Loomis Lake in 1998, with no fish observed spawning in the outlet cove above the cascade. Fish were attempting to return to the lake by going back up the cascade but were unsuccessful. By 22 July there were over 30 fish in the small outlet stream below the cascade, with about 20 in one 1 m by 0.5 m pool. These fish probably dropped down into Primrose Lake. Primrose Lake is a pond below Loomis Lake and was not stocked after the restoration of Loomis and Spruce Lakes. Up to 15 greenbacks were observed attempting to get up a small (1 m) waterfall at the inlet to Primrose Lake to spawn in the inlet stream. Only three 200 mm fish were observed above this waterfall, with none of these fish close to each other.

Summary of Gill Net Sampling, Loomis Lake, Outlet Trend Site, 1979-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/27/79*	Brook	202.00	40-255	1.7	no data
07/21/93	Greenback	203.35	155-236	18.7	1.63
08/15/95	Greenback	211.00	179-242	13.0	0.94

* Overnight net set

Angler Use

Pre-restoration catch rates averaged 2.5 fish/angler hour from 1972 to 1990. Loomis Lake opened to catch-and-release angling in 1993, with only two anglers having been interviewed since then. Those two anglers reported catching 18.3 greenbacks/angler hour. Catch rates prior to the restoration have averaged 1.26 fish/hour.

Summary of Creel Survey Data, Loomis Lake, 1962-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1962	0.29	2	24.0	Brook
1965	0.11	6	18.0	Brook
1966	0.50	12	38.0	Brook
1968	2.50	3	6.0	Brook
1972	1.80	5	9.0	Brook
1973	1.43	3	21.0	Brook
1984	4.00	1	4.0	Brook

1985	5.70	2	10.0	Brook
1987	1.23	4	6.5	Brook
1988	6.00	1	0.5	Cutthroat
1989	3.33	1	1.5	Brook
1990	0.50	1	2.0	Rainbow
1990	Exotic species removed			
1993*	no data collected			
1998	19.0	1	2.0	Cutthroat
1999	12.0	1	0.3	Cutthroat

* Opened to catch-and-release angling, closed 1990-1992

Lily Lake

Lily Lake is a 6.8 hectare artificial impoundment located on the eastern edge of RMNP along Highway 7. Prior to 1990, the previous owners created the lake, stocked rainbow trout and aerated the lake to maintain a sport fisheries. The land surrounding Lily Lake was donated and purchased by RMNP from 1991-1992, and a boundary adjustment was made to include these lands within RMNP (Lutz 1998). Since the lake is artificial, the site has no native fish population, and native plant and associated wildlife species were removed during the construction of the lake.

The lake is very shallow (< 2 meters), clear and relatively warm. The lake supports robust populations of aquatic plant species during the summer months. The lake is maintained by groundwater, seeps and a small inlet flow on the SE corner of the lake. There is no outlet stream.

During the period that ice covers the lake (October-April), decomposing aquatic vegetation removes oxygen, and makes trout survival impossible in most winters, without artificial aeration. To provide oxygen during the winter, the original mechanical aeration system was replaced with a liquid oxygen system. The liquid oxygen diffuses 0.1 to 0.4 liters per minute of pure oxygen under the ice, to maintain oxygen levels above 2 mg/l.

The goal of the Lily Lake greenback program is to provide the most NPS compatible fisheries program possible, and to conduct experiments on the response of native greenback cutthroat trout to catch-and-release sport fishing, Objective 4, Greenback Cutthroat Trout Recovery Plan.

Lily Lake

Current Population Status

A few large rainbow trout were present in June 1990, and none were observed or collected after 1993. Trout reproduction appears not to occur, or occurs at such a low level, that a long-term trout population cannot be maintained without artificial stocking.

Greenbacks were first introduced to Lily Lake 11 October 1990, with 2,668 surplus greenback fingerlings stocked. Surplus greenback fry were also available in 1991 (4,895), and in 1992 (2,500), due to surplus production, and some storms blocking the access to backcountry restoration sites. No greenbacks were available for Lily Lake from 1993 through 1997. On 18 May 1998, 904 greenback fingerlings from eggs collected at Upper Hutcheson Lake in 1997 were stocked into Lily Lake. All fish stocked in 1998, were marked with an adipose fin clip by school children and volunteers from Trout Unlimited.

The stocking of greenback fry and fingerlings in 1990, 1991 and 1992 was successful in establishing a greenback population. Greenbacks exceeding 337 mm were observed in gill net surveys by October 1992, with gill net catch rates increasing through 1994. Because Lily Lake has inadequate stream spawning habitat, greenbacks attempt to spawn along the shoreline, where wave action exposes gravel and cobble stones. There appears to be little, or no, recruitment to adult fish population from this spawning effort, with no fish under 200 mm captured in gill nets from 1994 to 1997.

Summary of Gill Net Sampling, Lily Lake, North Shore Trend Site, 1990-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
06/29/90	Rainbow	538.83	538.83	1.7	3.08
10/14/92	Greenback	297.09	246-337	29.3	7.28
10/28/93	Greenback	266.63	190-398	30.0	6.28
10/28/93	Rainbow	320.00	320	1.0	0.30
06/02/94	Greenback	279.39	194-377	83.3	18.93
05/12/95	Greenback	290.29	221-338	11.2	2.88
10/25/95^	Greenback	309.66	281-341	4.7	1.08
10/24/96	Greenback	302.46	257-358	3.3	1.02
09/27/97	Greenback	349.16	320-384	5.3	2.31
05/18/99	Greenback	296.24	225-387	27.0	6.89
10/22/99	Greenback	310.33	264-339	18.0	5.22

^ Net set at southeast inlet

Gill net survey catch rates decreased from 1994 through 1997, average fish length increased and angler success rates declined in a manner consistent with a population not recruiting at a sustainable rate. Thirty-eight percent of greenbacks caught in net surveys conducted on 18 May 1999 had adipose clips from the 1998 stocking. The clipped fish average 257 mm in length over a size range of 225 mm to 282 mm. Another survey on 22 October found all greenbacks caught having adipose clips. These greenbacks averaged 310.3 mm over a size range of 264 mm to 339 mm.

Visitor/Angler Use

Due to its roadside location, Lily Lake attracts anglers, and other users, throughout the summer months. Anglers who have limited time, or who are not capable of reaching remote wild RMNP greenback cutthroat trout fisheries, have the opportunity to catch a greenback at Lily Lake. As compatible with the Greenback Cutthroat Trout Recovery Plan, Lily Lake is managed as a catch-and-release fisheries to determine the response of greenbacks to catch-and-release fishing at a roadside location.

Visitor use surveys conducted by the Alpine Anglers Chapter of Trout Unlimited in 1997, 1998 nad 1999 (see Special Studies and Projects section, page 11), showed anglers represented 51.3% of users in 1997, 26.7% of users in 1998 and 35.5% of users in 1999. Visitor use peaked around 4 July and daily use peaked around noon for all three years.

Greenbacks from the 1990 stocking entered the creel survey data in 1992. Catch rates increased to 0.9 fish/angler hour in 1992, and peaked at 1.70 greenbacks/angler hour in 1993 as greenbacks from the 1990, 1991 and 1992 stockings grew to catchable size. Catch rates have decreased to a low of 0.54 greenbacks per angler hour by 1998. As expected due to the 1998 stocking catch rates rose to 0.67 to in 1999.

Summary of Creel Survey Data, Lily Lake, 1990-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1990	0.80	4	6.0	Rainbow
1991	0.60	9	14.0	Rainbow
1992	0.90	25	30.0	Cutthroat, rainbow
1993	1.70	46	107.1	Cutthroat
1994	1.23	29	53.0	Cutthroat
1995	1.09	77	113.1	Cutthroat
1996	0.64	51	183.5	Cutthroat
1997	0.80	150	473.8	Cutthroat
1998	0.54	80	243.8	Cutthroat
1999	0.67	177	477.8	Cutthroat

OTHER GREENBACK CUTTHROAT TROUT POPULATIONS

Big Thompson River-Forest Canyon

The Forest Canyon greenback population begins at a barrier above Spruce Creek, 2,574 m (8,445 ft), and extends 12.5 km to another barrier in a meadow at 3,242 m (10,637 ft). The river flows through a series of long alpine meadows which alternate with strips of dense conifer forest. The canyon walls are steep, with heavy timber on the slopes.

A two day angling survey of this population was conducted on 27 and 28 August 1957 (Bulkley). Fish were found to be abundant in all sections of the river except the section between 2,895 m (9,498 ft) and 3,048 m (10,000 ft). Fish were relatively scarce in this section and it was believed that this was due to anglers hiking down from Trail Ridge Road and fishing this section. Several age classes of fish were observed throughout the river. Twelve specimens were collected and preserved.

At the time of this survey there were no stocking records that showed plants of fish in Forest Canyon. Due to this and its remoteness and inaccessibility it was believed that these fish were an historic genetically pure population of greenback cutthroat trout.

This discovery led to a three-phase program: 1) a life history study of the greenback in Forest Canyon; 2) experimental propagation of greenbacks at the Leadville National Fish Hatchery with no

Upper Forest Canyon Meadow

success; and 3) introduction of greenbacks into renovated habitat typical of park waters.

The life history study of greenbacks was conducted by Bulkley (1959) in Forest Canyon:

Length, Growth and Age. Bulkley found that: "the cutthroat in Forest Canyon Creek rarely exceed nine inches in total length. Collections were made over the entire stream, and the largest fish captured measured 236 mm. The average length of adult fish was slightly less than eight inches."

To determine the length frequency of the population fish were removed from a 100 yard section of stream. The size range of the fish removed was 85 mm to 212 mm. Fish were aged using scales and it was found that two and three year old fish were the predominant age classes. No young of the year were captured in the study section but they were observed upstream.

Average total lengths for age one fish were 93.12 mm, for age two fish they were 130.13 mm, for age three fish they were 173.59 mm and for age four fish they were 205.40 mm.

Food Habits. Analysis of bottom samples from four different locations during the summer indicated low stream productivity. Stomach contents of 40 fish found that three fourths of food present were terrestrial organisms. Stomach contents taken in early June found more aquatic organisms than samples taken later in the summer.

Reproduction. The first spawning was observed on 1 July and spawning was completed by 15 July. A two way trap was installed in late June to gather information on migrating spawning fish. Few fish were captured in the trap indicating that there is not a large migration to spawn. There is suitable spawning substrate in most stream sections so there is little need for extensive movement to spawn.

Scale analysis of spawning fish caught by angling found that almost all fish were age three or age four. Males outnumbered females almost two to one. Fry were first observed to have emerged on 26 August. It was estimated that fry mortality was high, however, this mortality was not due to predation from adult fish based on stomach analysis.

Fifty greenbacks were removed from Forest Canyon in 1958 and another 83 were removed in 1959 (Cope) and taken to the Leadville National Fish Hatchery with the hopes of using these fish as a broodstock to stock restoration projects. A similar effort was undertaken in 1957 from another greenback population. Twenty-six greenbacks were removed from Albion Creek and taken to Leadville. These fish proved to be unsuited to hatchery conditions and few survived. The fish that did survive had good growth but problems with asynchronous maturation prohibited spawning at the hatchery. These same problems befell the Forest Canyon greenbacks as well and the project was abandoned.

To expand the range of the greenbacks fish were removed from the Fay Lakes drainage in 1958 and Fay Lake was restocked with 209 greenbacks removed from Forest Canyon. These fish moved out of Fay Lake and into Caddis Lake downstream where offspring are still present.

In 1961 two specimens were collected from Fay Lake to try and positively identify the Forest Canyon cutthroats as greenbacks. Dr. Robert Rush Miller, Curator of Fishes, University of Michigan Museum, could not do this due to the vagueness of the original description (Azevedo and Wallis 1962).

In the early 1960's stocking records were found showing that Forest Canyon was stocked with Yellowstone cutthroat fry in 1922 and 1923. It was concluded that the cutthroats in Forest Canyon were contaminated and Forest Canyon, as well as the Fay Lakes were proposed to be returned to their original management status.

Ninety-two cutthroats were removed from Forest Canyon on 20 July 1965 and taken to the Leadville National Fish Hatchery. It was proposed that these trout would be reared through three generations to determine if they would maintain their characteristics and breed “true” (Wallis 1967). Once again problems with asynchronous maturation prohibited this project from completion and the trout were stocked into Florence Creek, a barren headwater tributary on the Uinta and Ouray Indian Reservation, Utah in 1967 (Behnke 1967). These fish successfully reproduced and became established (Behnke 1976), but became displaced by brook trout by 1978.

Taxonomic analysis of the Forest Canyon cutthroats by Dr. Robert Behnke in 1972 determined that they were greenback cutthroat trout and represented as good an approximation of the original native species as could be found at that time (Behnke 1976).

Electrofishing surveys were conducted at seven sites in September 1980 to obtain abundance and age structure information. Survey results:

Site	GBC/100'	Avg. Length (mm)	Avg. Weight (grams)
Pools @ 2697 m	70.89	205.38	94.00
Riffle @ 2697 m	17.99	188.75	85.00
Downstream of Gorge Lakes Jct.	23.22	171.73	58.46
Upstream of Gorge Lakes Jct.	32.29	182.55	65.78
Rock Cut	21.72	185.96	69.25
Unnamed Creek @3078 m	12.00	148.33	39.77
Meadow @ 3194	29.34	149.50	40.00

Fish were aged using length-frequency and it showed that the majority of fish were in the age four and age five age classes. There was a sharp decrease in the numbers of fish in age classes over age five. The size of fish also was shown to decrease as the elevation increased.

Samples were collected from four sections of Forest Canyon in 1980 and given to Dr. Behnke and Eric Wagner (1982). They were determined to be essentially or virtually pure greenbacks with little or no taxonomic differences found between sites.

Bulkley's 1958 study was in the same area and probably included the same meadow section that was surveyed in 1980. Bulkley found fish averaging 145.23 mm over a size range of 85 mm to 212 mm compared to 149.5 mm over a size range of 102 mm to 262 mm in 1980. The fish density in a 100 yard section was 14.33 fish/100' in 1958 compared to 29.34 fish/100' in 1980.

A hook-and-line survey conducted on 25 September 1985 near the junction with Hayden Creek found nine greenbacks averaging 206.33 mm over a size range of 193 mm to 259 mm.

Current Population Status

On 5 July 1999 a hook-and-line survey conducted upstream of the Gorge Lakes stream junction caught 17 greenbacks. These fish averaged 206.37 mm over a size range of 182 mm to 251 mm. Most males were ripe and females were about a week away from spawning.

Tissue samples were taken from 15 fish and given to Don Proebstel for genetic analysis. He determined that they were A- greenback cutthroat trout. There was evidence that this population was derived from multiple sources and phenotypic variability was also observed based on slides taken at the time of collection.

Angler Use

During the 1985 hook-and-line survey near Hayden Creek nine greenbacks were caught in one hour out of one pool. In 1999 during tissue collection 17 greenbacks were caught by three anglers in a total of 6.5 hours. All of these fish were easily caught in a 150 foot section of the river above the Gorge Lakes stream with two fish being caught twice.

Summary of Creel Survey Data, Big Thompson River-Forest Canyon, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	Closed to Angling			
1962*	11.0	1	22.0	Cutthroat
1964	1.38	14	70.0	Cutthroat
1965	2.11	6	18.0	Cutthroat
1966	2.43	17	243.0	Cutthroat
1967	1.35	12	37.0	Cutthroat
1969	1.13	59	299.0	Cutthroat, brook, rainbow
1986	5.20	1	2.5	Cutthroat
1999	5.90	4	10.5	Cutthroat

* Opened to angling

Arrowhead Lake

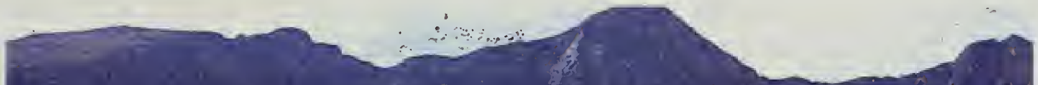
Arrowhead Lake, 14 ha, is located on an unnamed tributary of the upper Big Thompson River. It is the lowest lake in a string of lakes known as the Gorge Lakes which also includes Doughnut, Inkwell, Azure and Highest Lakes. The Gorge Lakes are located in a remote area of RMNP with no maintained trails leading to them.

Due to its high elevation, 3,400 m (11,155 ft), water temperature is the major limiting factor to fish production at Arrowhead Lake. The inlet has good spawning habitat while the outlet has virtually none. Due to these factors reproduction does not occur every year.

The earliest stocking record shows 20,000 "black spotted" fry being stocked in 1913. "Black spotted" fry were also stocked in 1931-1933, 1938, 1939 and 20,000 "black spotted" eyed eyes in 1944. Stocking records also show plants of rainbow trout in 1936 and 1937.

In spite of its isolation Arrowhead was at one time a popular destination for anglers. Merlin K. Potts in his 1936 records reports that year the cutthroat trout measure 12 to 15 inches (Wallis and Azevedo 1961). He further states that "at present this lake is well stocked but the supply is being rapidly depleted by extensive fishing. Parties of 15 to 20 fisherman are common on week-ends."

By 1960 it was believed that Arrowhead Lake was barren, however, due to the finding of a potentially pure population of greenbacks in Forest Canyon, downstream of the Gorge Lakes



Arrowhead Lake

drainage, stocking was suspending pending the outcome of taxonomic analysis of the Forest Canyon cutthroats. With the finding that Forest Canyon had previously been stocked with Yellowstone cutthroat trout, it was proposed that Arrowhead Lake be stocked with cutthroat trout every fourth year starting in 1962. The last plant would have been made in 1967, the last year that lakes in RMNP were stocked for recreational fishing.

To determine the existence of any fish that might be remaining from the proposed 1960's stockings, gill net surveys were conducted on 13 and 14 September 1978 (Rosenlund 1978). Two nets were set, one across the outlet and one across the west side. No fish were caught in the west net which was set for 17 hours and two cutthroats were caught in 15.5 hours in the outlet net. These fish averaged 442 mm. One of these fish appeared to be a rainbow x cutthroat hybrid. Scales were collected from one of the fish and at least eight annuli were counted but were difficult to read. It was assumed that these fish were from the last stocking of fish in the late 1960's.

Another gill net survey was conducted on 19 and 20 August 1987. Nets were set across the inlet and outlet. No fish were caught in the inlet net in 12 hours and two cutthroats were caught in 18 hours in the outlet net. One cutthroat measured 330 mm and the other, estimated at 600-700 mm, escaped before it was measured. Based on this data at least one successful spawn had occured since 1968.

A gill net survey in 1992 caught 4 cutthroats at the inlet in 14.5 hours. These fish averaged 276 mm in length over a size range of 180 mm to 360 mm. Another 330 mm fish was caught by angling. Nine cutthroats were observed in the inlet spawning.

Since cutthroats do not successfully spawn each year it was decided to try and slowly shift the fish population to an “almost” pure population by stocking pure greenbacks. On 23 September 1992 5,000 50 mm greenbacks were stocked, or a rate of 60.71 fish/hectare.

Current Population Status

On 31August 1998 13 greenbacks were caught in three net sets, a total of three hours, two at the outlet and one at the east cove. These fish averaged 318 mm over a size range of 293 mm to 356 mm. All fish could have come from the 1992 stocking.

Tissue samples were collected from all fish and taken to Don Proebstel for genetic analysis. He determined that they were A- greenback cutthroat trout with a slight Yellowstone cutthroat trout influence.

Summary of Gill Net Sampling, Arrowhead Lake, Outlet Trend Site, 1978-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
09/14/78$^{\#}$	Greenback	442.25	432-452	0.12	nd

08/20/87#	Greenback	490*	330-650*	0.11	0.12*
07/22/92^#	Greenback	276.25	180-360	0.27	0.08
08/31/98	Greenback	311.20	293-330	2.50	0.73

Overnight net set
* One fish was dropped, these numbers are estimates
^ Net set at inlet

Angler Use

Catch rates over the years have been very low. Arrowhead Lake was at one time a popular area to fish when it was stocked regularly. Currently due to it's inaccessibilty, a difficult 6.5 miles from the closest trailhead, it receives little angling pressure. One angler interviewed in 1999 stated that the fishing was not as good as usual even though 1999 had the highest catch rate of any year where creel data was collected.

Summary of Creel Survey Data, Arrowhead Lake, 1961-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1961	0.00	10	70.0	
1962	0.00	6	36.0	
1963	0.00	6	24.0	
1964	0.00	7	39.0	
1965	0.13	7	23.0	Cutthroat
1966	1.09	8	86.0	Cutthroat, rainbow
1967	0.27	14	48.0	Cutthroat
1968	0.49	13	39.0	Cutthroat
1969	0.78	23	135.0	Cutthroat, brook
1972	no data	1	no data	Rainbow
1976	0.00	1	2.0	
1984	0.07	4	14.0	Cutthroat
1997	0.60	2	10.0	Cutthroat
1999	1.66	1	3.0	Cutthroat

Ypsilon Lake

Ypsilon Lake is a 3 ha lake with a maximum depth of 17 m located along Ypsilon Creek at an elevation of 3,215 m. It contains limited inlet spawning habitat and more extensive outlet spawning habitat.

Stocking records show: a total of 69,000 cutthroat fry or fingerlings stocked in 1923, 1939, 1947 and 1955; biennial stocking of 2,500 cutthroat fingerlings from 1962 to 1968; 16,000 brook trout fry from 1933 to 1935; and 5,000 rainbow trout fry in 1937. Despite all this stocking only cutthroat trout were found by 1972.

Based on a 1957 survey (Bulkley), where no fish were caught in a 12 hour net set and no fish were observed in 4 days of camping on the shore, it was believed that Ypsilon Lake could not support a reproducing population of trout. Because of this the biennial stocking of cutthroats was undertaken in the 1960's. Stocking of all fish ceased after 1968.

A gill net survey in 1972 captured 24 cutthroat trout in 22 hours (Mullen 1973). All fish appeared in excellent condition, even the spawned out females, and contained large amounts of visceral fat. Several year classes were present with only the largest fish being associated with the last stocking in 1968.

Gill net surveys in 1979 captured cutthroats between 257 mm and 342 mm (Rosenlund 1979). Fish were also observed in the outlet possibly attempting to spawn. Specimens were collected for Dr. Behnke (1980) for taxonomy who classified them as "virtually pure Colorado River cutthroat trout."

Cutthroats with a size range of 160 mm to 280 mm were captured in gill nets in 1988. Based on the gill net survey data, as well as creel survey data, it would appear that successful reproduction occurs only periodically.

Current Population Status

Twenty specimens averaging 265 mm were collected in 3.3 hours of gill netting and 12 tissue samples were collected by angling in 1998. Gill netting captured cutthroats ranging in size from 210 mm to 302 mm while angling produced a greater size range, from 132 mm to 330 mm. Deformities were found in 12.5% of the fish sampled in 1998.

Summary of Gill Net Sampling, Ypsilon Lake, Inlet Trend Site, 1957-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/06/57*	No fish caught in a 12 hour set				
07/19/72*	Cutthroat	no data	165-379	0.6	no data

07/09/79	Colorado River	298.65	297-300	1.3	0.34
07/10/79^	Colorado River	291.42	257-342	1.8	0.48
07/18/88	Colorado River	224.63	160-280	6.8	0.79
08/21/98	Colorado River	265.09	210-302	6.4	1.32

* Overnight net set
^ 2 nets set

Taxonomic analysis of these samples was conducted by Don Proebstel. He determined that these fish were A- Colorado River cutthroat trout with a slight Yellowstone cutthroat trout influence. Evidence of multiple sources was also observed. Since Colorado River cutthroat probably gave rise to the greenback, the two sub-species are difficult to separate.

Angler Use

An abundant amount of creel survey data is available from Ypsilon Lake. Catch rates were very low in the late 1950's and early 1960's prior to the biennial stocking of cutthroats in the 1960's. After the stocking program began catch rates increased. Interestingly, after stocking ceased after 1968 the catch rates increased to over 1 fish/hour for the first time. In 1999, one angler reported not catching any fish in 4 hours of fishing.

Summary of Creel Survey Data, Ypsilon Lake, 1958-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1958	0.06	no data	no data	no data
1961	0.07	9	82.0	Cutthroat
1962	0.25	29	170.0	Cutthroat, brook
1963	0.48	11	46.0	Cutthroat, rainbow
1964	0.55	12	60.0	Cutthroat
1965	0.36	13	85.0	Cutthroat, rainbow, brook
1966	0.45	21	142.0	Cutthroat, brook
1967	0.25	24	102.0	Cutthroat, brook, rainbow
1968	0.02	11	123.0	Cutthroat, brook
1969	0.43	33	123.0	Cutthroat, rainbow
1973	16.0	1	1.0	Cutthroat
1976	0.44	3	4.5	Cutthroat
1984	0	3	9.0	
1986^	1.50	2	10.0	Brook, cutthroat
1987	1.46	12	26.0	Cutthroat, rainbow
1988	1.20	4	6.5	Cutthroat
1989	0.66	7	21.0	Cutthroat, brook
1992	1.70	3	7.0	Cutthroat

1996	0.22	2	4.5	Brook
1998	1.15	4	9.5	Cutthroat
1999	0	1	4.0	

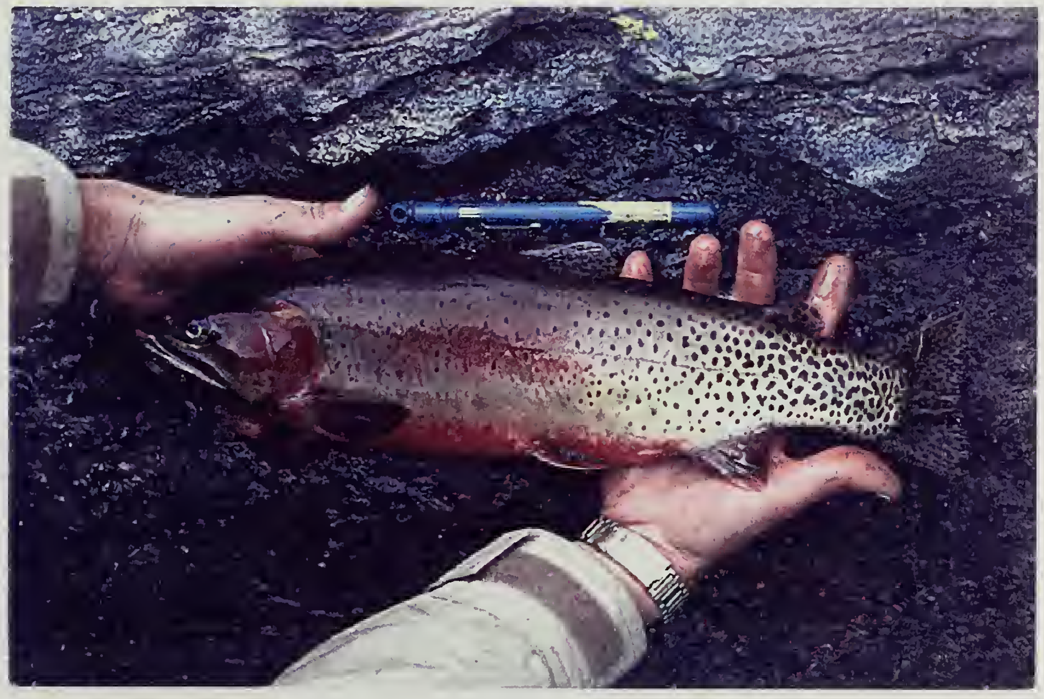
^ Includes data from Ypsilon Creek

BACKGROUND ON COLORADO RIVER CUTTHROAT TROUT

The Colorado River cutthroat trout's (*Oncorynchus clarki pleuriticus*) historic range includes the cool water habitat of the Colorado River basin from the headwaters along the Continental Divide to the Grand Canyon. This area encompasses the western half of Colorado, the eastern half of Utah, southwestern Wyoming and small parts of Arizona and New Mexico.

When European settlers arrived the same problems that befell the greenback cutthroat trout led to the decline of the Colorado River cutthroat trout. Activities related to supporting the booming mining industry, such as pollution, overharvesting, siltation and dewatering, had negative affects on the cutthroats. However, the largest factor which contributed to their decline was the introduction of non-native trout which outcompeted and hybridized with them.

By 1979, it was estimated by Dr. Robert Behnke that good representatives of Colorado River cutthroats occupied less than 1% of its original range (Trotter 1987). In late 1999 the Colorado River cutthroat trout was petitioned for listing under the Endangered Species Act (Center for Biological Diversity 1999). Currently, one of the largest concentrations of Colorado River cutthroat trout populations occurs within RMNP. Eight historic populations containing good representatives of the species and 2 restoration populations exist within RMNP.



Male Colorado River Cutthroat Trout From Timber Lake

Lake Nanita

Lake Nanita, 13.6 ha, is one of the largest lakes in RMNP and is located in the North Inlet drainage at an elevation of 3,290 m (10,794 ft). Stocking records show a plant of 10,000 native fry in 1931 and 10, 000 "black spotted" fry in 1933. The outlet has two outflow streams that unite to form a 21 m by 61 m pool about 45 m below the lake. The stream plunges over steep cascades about 0.1 km below the pool. There are no barriers to fish movement between the lake and the cascades along the larger of the two outflow streams. In the spring, usually early to mid-July, hundreds of Colorado River cutthroat trout crowd this outlet system to spawn.

A survey conducted in 1961 sampled trout in excellent condition with a size range of 64 mm to 305 mm (Azevedo and Wallis 1962). At that time spawning habitat was described as limited, but natural reproduction was adequate to maintain a balanced population.

On 17 July, 1973, two gill nets, one of which fished ineffectively, set for a total of 4 hours caught five cutthroats (Mullen 1973). These fish "appeared to be greenback cutthroat trout as described for Lake Nanita and Caddis Lake." All fish were ripe or partially spent and had a size range of 272 mm to 369 mm.

Lake Nanita

The last gill net trend survey conducted at Lake Nanita was in 1980. The survey had a catch rate of 1.5 fish/net hour, similar to the 1.3 fish/net hour in 1973. Cutthroats in 1980 were over a greater size range than the 1973 survey, 168 mm compared to 374 mm. Young of the year were found to be abundant in the outlet. No YOY were observed in the inlet.

Seven specimens were collected on 9 July 1987 by hook-and-line and given to Dr. Robert Behnke for taxonomy. These fish were caught in one hour, were in good condition and ranged in size from 145 mm to 302 mm. Numerous fish were observed in the outlet. Dr. Behnke (1988)concluded from meristic characters that:

"The Nannita(sic) Lake population appears to be a pure cutthroat trout but of more than one parental source. The spotting pattern is variable with some specimens exhibiting larger, greenback-like spots."

The same specimens were examined by Anita Martinez (1990) of the Colorado Division of Wildlife (CDOW), in 1990. She assigned a rating of A from the Binns system of classification based on their meristic characters.

In 1989, Dr. Behnke (*pers.comm.*) determined that the Lake Nanita fish were pure Colorado River cutthroat of mixed parentage which are excellent for reintroduction.

More specimens were collected in 1990. These were given to Robb Leary and Fred Allendorf (1991) of the Wild Trout and Salmon Genetics Laboratory at the University of Montana. Genetic and meristic analysis of the specimens determined that Lake Nanita were pure Colorado River cutthroat trout with little genetic variability. Samples of other presumed Colorado River cutthroat trout populations were also analyzed. The Williamson Lakes, California population was the only other one determined to be pure. The population in Trappers Lake, where the Lake Nanita and Williamson Lakes populations were founded from, was determined to be hybridized with Yellowstone cutthroat trout.

Disease sampling in 1990 found the Lake Nanita population positive for Enteric Redmouth disease.

Egg and Milt Collections

Trappers Lake contained one of the best populations of Colorado River cutthroat trout within Colorado, with eggs from Trappers Lake used for stocking other waters within the state for many years.

Since Trappers Lake cutthroats were found to be hybridized, Lake Nanita has the best population of Colorado River cutthroats suitable for the taking of eggs. Thirteen thousand eggs were collected on 5 July 1990 with 60% fertility. The Colorado Division of Wildlife collected eggs in 1991, 1992, 1996 and 1998. Thirty-one thousand eggs were collected in 1992 and 20,000 were collected in 1996. With eggs taken from Lake Nanita, the CDOW has established a Colorado River cutthroat broodstock near Kremmling. It is anticipated that this broodstock will produce up to one million eggs annually. Lake Nanita eggs will be required by the CDOW in the future to maintain the genetics of the broodstock, with 10,000 to 15,000 eggs probably being required every other year for this purpose.

Current Population Status

The most recent data on the population at Lake Nanita is from 1990, when eggs were collected by FWS. A gill net set across the outlet caught 24 cutthroats in 1 hour. Two to three thousand fish were observed in the outlet and about 50 fish were observed around the west outlet. Fifty cutthroats handled during spawning averaged 348 mm with a range of 270 mm to 395 mm.

Summary of Gill Net Sampling, Lake Nanita, Outlet Trend Site, 1973-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/17/73*	Colorado River	no data	272-369	1.3	no data
09/25/80*	Colorado River	280.88	168-374	1.5	0.37
07/05/90	Colorado River	no data	no data	24.0	no data

* Overnight net set

Angler Use

Lake Nanita is the only area on the west side of RMNP containing pure Colorado River cutthroats that is open to harvest. Since 1989, anglers reported releasing 86% of the fish that they caught. A report in 1961 stated that fishing pressure was moderate to heavy at this type of lake and that there was heavy use of the camp sites at Lake Nanita.

Anglers reported catching 0.47 cutthroats/angler hour from 1961 to 1969. Limited creel survey data is available from the 1970's and early 1980's. Since 1989, catch rates have ranged from 5.6 cutthroats/angler hour in 1992 (12 anglers interviewed) to 0.75 cutthroats/angler hour in 1997 (3 anglers interviewed). The average catch rate has been 2.23 cutthroats/angler hour since 1989.

Summary of Creel Survey Data, Lake Nanita, 1961-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1961	0.39	29	261.0	Cutthroat, rainbow
1962	0.33	3	3.0	Cutthroat
1964	0.66	18	98.0	Cutthroat
1965	2.08	4	12.0	Cutthroat, brook
1966	0.24	53	1,059.0	Cutthroat

1967	0.85	55	256.0	Cutthroat
1968	1.15	19	119.0	Cutthroat
1969	0.45	18	137.0	Cutthroat, rainbow, brook
1975	0.81	3	73.0	Cutthroat
1976	1.16	10	39.5	Cutthroat, rainbow
1984	1.00	1	4.0	Cutthroat
1989	2.50	8	16.0	Cutthroat
1990	1.12	45	155.0	Cutthroat
1991	2.97	28	56.3	Brook, Cutthroat
1992	5.60	12	24.0	Cutthroat
1993	1.52	9	29.0	Cutthroat
1994	2.77	11	6.5	Cutthroat
1995	2.50	3	2.0	Cutthroat
1997	0.75	3	8.0	Cutthroat
1999	3.35	13	92.5	Cutthroat

Adams Lake

Adams Lake is a 1.83 ha lake located along the southern boundary of RMNP at an elevation of 3,419 m (11,218 ft). It is the third highest lake in RMNP that contains fish. Spawning habitat exists in the outlet and in several of the small inlets that feed the lake.

The only stocking record shows 6,860 "black spotted" eyed eggs being stocked in July 1942. Paradise Creek was also stocked with "black spotted" eyed eggs in 1942. Specimens from the Paradise Creek population were examined by Eric J. Wagner (1982) from Colorado State University in 1982 and found to be pure Colorado River cutthroat trout from the Trappers Lake stock. This information plus the fact that Adams Lake cutthroats appear to be excellent phenotypes of Colorado River cutthroat trout would indicate that they are pure specimens.

A survey conducted in 1963 (Linn 1963) found three year classes of cutthroats present but no small fish were caught or seen. Six cutthroats were caught in a 20 hour gill net set on the east shore. An additional six cutthroat were caught by hook and line. All fish were over a size range of 203 mm to 406 mm and were fat. Females had a few eggs left from the 1963 spawning season and were beginning to grow eggs for 1964.

An overnight gill net survey conducted in August 1981 captured 5 fish in a 17 hour set. The fish averaged 305 mm with a size range of 228 mm to 369 mm. Spawning in Adams Lake appears to occur intermittantly.

Adams Lake

Current Population Status

The last survey conducted at Adams Lake was on 17 July 1990. Two gill nets set for a total of 4 hours did not catch any fish (Proebstel 1990). Approximately 50 fish were observed about 500 yards below the lake. These fish represented several age classes with a size range estimated to be from 100 mm to 400 mm. Five of these Colorado River cutthroats were caught by angling, with a size range of 170 mm to 340 mm. It is expected that this population will be surveyed in 2000.

Summary of Gill Net Sampling, Adams Lake, Outlet Trend Site, 1963-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/03/63*^	Cutthroat	no data	203-406	0.30	no data
08/13/81*	Colorado River	305.12	228-369	0.29	0.11
07/17/90	No fish caught in two nets set for 4 hours				

* Overnight net set
^ Net set on east shore

Angler Use

Adams Lake is located 14.5 kilometers from the closest RMNP trailhead with most of this distance being crosscountry. Due to its remoteness it receives very little visitation. In addition to the following data, one reported catching 9 fish in six hours from Adams Lake and Paradise Creek in 1961.

Summary of Creel Survey Data, Adams Lake, 1966-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1966	0.83	2	24.0	Cutthroat
1993	0	1	0.3	

Timber Lake and Creek

On 5 September 1979, non-native cutthroat trout were removed with 3.35 ug/l of antimycin from 4.09 ha Timber Lake, and from 4.4 km of Timber Creek, to make habitat available for a pure strain of Colorado River cutthroat trout (Rosenlund and Stevens 1989). Elevation of this project extends from 3,371 m at Timber Lake to the barrier at 2,865 m.

Timber Lake. The total weight of cutthroat trout recovered from Timber Lake was 9.76 kg, or 2.4 kg/ha. Estimating that the recovery was only 70% effective, the 1979 estimated cutthroat trout population was 3.4 kg/ha. A trout biomass of 3.4 kg/ha is very low for RMNP, and reflects the impact catch-and-kill fishing had on this population.

Timber Lake was restocked with 1,080 Clinton Gulch Colorado River cutthroat trout at 28 mm in length 27 September 1979, and 925 fry at 25mm in length on 17 September 1980.

The spawning habitat of Timber Lake is limited to a cobble substrate outlet with no riparian vegetation. Eggs were first observed in the outlet in 1984. By protecting the cutthroats from angler harvest, fish densities exceeded the 1979 level, with year classes at 150 mm, 205 mm and 420 mm captured in gill nets by 27 August 1986.

Timber Lake

In general catch rates have increased each time the lake has been surveyed since the restoration. Gill net surveys conducted in 1988 and 1991 caught just over 3 fish/net hour and had wide size ranges, 182-315 mm in 1988 and 165-375 mm in 1991, and had smaller fish present. Based on net survey data it appears that this population reproduced intermittantly.

Timber Creek. A total of 269 cutthroat trout weighing 11.2 kg were recovered from 4.4 km of Timber Creek through 7 September 1979. The best stream habitat, and the largest population of cutthroat trout was found in Jackstraw Meadow, with an average of 40 cutthroat trout and 1.23 kg of fish per 100 m of stream.

Timber Creek was restocked with Clinton Gulch Colorado River cutthroat trout, 920 at 28 mm on 27 September 1979, and 1,850 at 25mm on 17 September 1980.

Sampling of Jackstraw Meadows 27 August 1986, collected 72 cutthroat trout representing five year classes between 30 mm and 255 mm.

Current Population Status

Timber Lake. Four gill net surveys conducted in 1998 at 4 locations caught 16 cutthroats in 4 hours of fishing. One net set at the outlet trend site did not catch any fish in one hour. The other net sets were on both sides of the inlet. No fish smaller than 317 mm were caught with larger fish looking skinny. One mortality had an empty stomach.

Tissue samples were collected all fish and were sent to Don Proebstel for genetic analysis. He determined that they were pure Colorado River cutthroat trout from a single source.

Summary of Gill Net Sampling, Timber Lake, Outlet Trend Site, 1963-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/19/63*	Unknown	269.40	178-356	0.5	no data
07/10/74~	Cutthroat	no data	117-343	0.4	no data
07/10/74~	Rainbow x Cutthroat	368.30	343-394	0.1	no data
07/11/79	Cutthroat	237.00	178-310	1.4	0.20
09/30/81	Colorado River	230.00	230	0.4	0.05
07/08/82	Colorado River	168.00	165-175	0.7	0.03
07/19/84	Colorado River	304.00	265-325	1.1	0.38
08/27/86	Colorado River	289.00	150-205	1.6	0.82
08/08/88	Colorado River	260.40	182-315	3.3	0.80
09/05/91	Colorado River	283.33	165-375	3.1	0.78
09/13/98	No fish caught in a 1 hour set				
09/13/98^	Colorado River	359.68	317-435	5.3	2.32

* Overnight net set
~ 2 nets set overnight
^ Data is for 3 net sets near inlet, other net set on same date was at outlet trend site.

Timber Creek. Angling surveys were conducted in 1991 along Jackstraw Meadows and above the Long Meadows trail. There were 2 or more fish in every adequate section of stream in both areas. Cutthroats in Jackstraw Meadows were within a narrower size range than those near the Long Meadows trail. Twelve fish were caught in Jackstraw Meadows ranging in size from 165 mm to 220 mm. Seven fish were caught above the Long Meadows trail ranging in size from 135 mm to 250 mm.

A visual survey of Jackstraw Meadows in 1998 did not observe any fish. Two fish were caught with hook and line near the Long Meadows trail in a half hour of fishing with other fish observed.

Angler Use

Timber Lake and Creek was open to catch-and-release fishing in 1987, with the area signed and creel survey collected by 1988. Unfortunately, the signs identified Timber Lake as a "greenback restoration project", but they did not inform anglers that the area was open to catch-and-release fishing.

Timber Lake. Catch rates through the 1960's were 0.83 fish/angler hour. Creel survey data collected by RMNP rangers showed anglers catching Colorado River cutthroat trout from Timber Lake at a rate of 0.5 fish per hour in 1988, and 0.33 fish per hour in 1989. Catch rates peaked in 1992 when two anglers fishing for 4 hours caught 15 Colorado River cutthroats. While conducting net surveys in 1998 no fish were caught in about 90 minutes of angling, however it was very windy.

Summary of Creel Survey Data, Timber Lake, 1961-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1961	0.38	5	13.0	Cutthroat
1962	0.29	2	24.0	Cutthroat
1964	0.12	15	17.0	Cutthroat
1966	2.08	4	12.0	Cutthroat
1967	0.33	2	12.0	Cutthroat
1968	1.72	8	25.0	Cutthroat, rainbow
1975	0	1	1.0	
1979	Exotic species removed			
1987*	no data collected			
1988	0.50	3	2.0	Cutthroat
1989	0.33	1	6.0	Cutthroat
1991	0	1	0.5	
1992	3.80	2	4.0	Cutthroat

* Opened to catch-and-release angling, closed 1979-1986.

Timber Creek. One angler reported catching 6.57 fish per hour from the stream through Jackstraw Meadows in 1989. Catch rates appeared good in 1991 based on the angling survey conducted in Jackstraw Meadows and near the Long Meadows trail. Since then catch rates have decreased based on available data.

Summary of Creel Survey Data, Timber Creek, 1972-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1972	0.50	2	4.0	no data
1979	Exotic species removed			
1987*	no data collected			
1989	6.57	1	3.5	Cutthroat
1994	1.00	3	5.0	Cutthroat
1997	0	1	1.0	

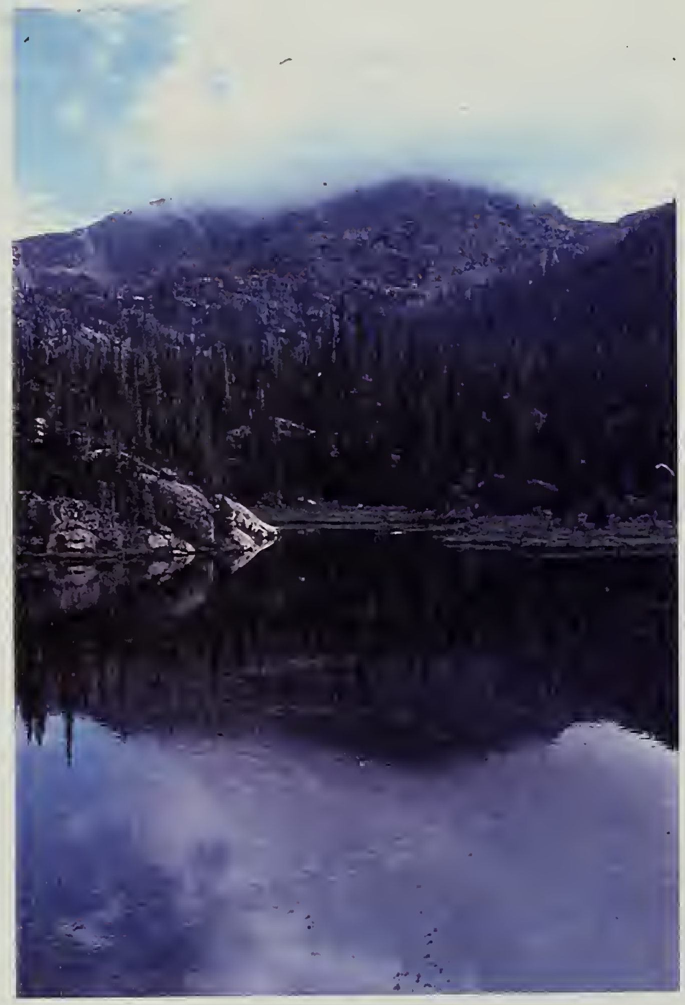
* Opened to catch-and-release angling, closed 1979-1986

Bench Lake and Ptarmigan Creek

Bench Lake was the only lake within the cirque upstream of War Dance Falls found to contain a reproducing population of fish, although fish had been introduced into lakes upstream of Bench Lake prior to 1969. Located at an elevation of 3,030 m (9,941 ft), Bench Lake is 2.6 ha, with a maximum depth of 1 m. Upstream of Bench Lake 1.5 km of stream supported a reproducing population of Yellowstone cutthroat trout, with July flows of 0.41 to 0.74 cms.

Bench Lake is very shallow, but maintained a population of Yellowstone cutthroat trout for several decades prior to their removal in 1986. Ptarmigan Creek is located above Bench Lake, with both areas isolated in a hanging valley that is not served by a maintained trail system.

On 4 September 1985, the Yellowstone cutthroat trout population that existed above War Dance Falls was removed with antimycin, to make habitat available for a pure strain of Colorado River cutthroat trout (Rosenlund and Stevens 1989). A total of 653 cutthroats averaging 206 mm over a



Bench Lake

size range of 89 mm to 343 mm were collected from Ptarmigan Creek above Bench Lake (44 fish/100 m). In Bench Lake, 284 fish averaging 241 mm over a range of 89 mm to 393 mm were collected and removed following treatment. above Bench Lake (44 fish/100 m).

Mark recapture data was collected on Bench Lake by Colorado State University. Thirty seven fish were marked and 29 were "recaptured" following the treatment (Bergersen 1988b). A Peterson population estimate based upon the above resulted in a point estimate of 361 fish with a 95% C.I. of 254 to 531 fish. The mean weight of fish measured was 145.5 g. Total biomass was 56.06 kg, or 21.56kg/ha.

This area was scheduled for restocking with a pure strain of Colorado River cutthroat trout in 1986. Sources of Colorado River cutthroat trout considered were, Paradise Creek, RMNP, other Colorado populations of Colorado River cutthroat trout, and the Trappers Lake strain of Colorado River cutthroat trout present in Williamson Lakes, California.

Paradise Creek presently supports a good population of fish, and is not imperiled. Only a few other populations of pure Colorado River cutthroat trout were known to exist within Colorado in 1986, but these were small or below carrying capacities. The present Colorado River cutthroat trout population in Trappers Lake has become hybridized with Yellowstone cutthroat trout, and pure populations of Trappers Lake Colorado River cutthroats are limited within Colorado.

Considering that the Paradise Creek population was stable, and that other Colorado populations were present, but their numbers were below the carrying capacity of the stream already inhabited, the best use of Bench Lake appeared to be for the reintroduction of the Trappers Lake strain of Colorado River cutthroat trout. Contact with Mr. Phil Pister, California Department of Fish and Game, in 1986, revealed that Colorado River cutthroat trout would be available from Williamson Lakes. Williamson Lakes are located within a trailess area with Forest Service wilderness status.

After considerable planning, and efforts by several agencies, a total of 296 Williamson Lakes cutthroats were moved from California to RMNP on 20 August 1987. The operation began at 0730 at Williamson Lakes, and concluded at 1630 the same day at Bench Lake in RMNP. The operation required the California F&G aircraft for transport of fish from Bishop, CA to Kremmling, CO, along with two helicopters and two fish trucks for transfers within California and Colorado. Of the 296 transplanted at the rate of 125 g/1L of water (1 lb/gallon) with oxygen and cooling, less than 2% were lost. Funding for this project was supplied by RMNP and a grant from Exxon through the Colorado Division of Wildlife.

Special thanks for this project should be given to Mr. Phil Pister of the California Department of Fish and Game for organizing and coordinating the collection of the Williamson Lakes fish, and arranging for the use of the California F & G airplane to transport the fish to Colorado.

Bench Lake. The 361 adult Yellowstone cutthroats removed in 1985, were replaced with 194 adult Colorado River cutthroats in 1987, with the new population anticipated to produce gill net catches close to 50% of those observed in 1981.

Bench Lake was surveyed one year after the stocking with adult Colorado River cutthroat trout, with a gill net set for two hours on 27 September 1988, capturing one Colorado River cutthroat trout. Two adults were also observed in the lake, with 19 mm YOY present in the inlet stream in September 1988. The gill net catch of 0.5 fish/net hour was very close to the anticipated catch rate, and although there were signs of angler use and no "closed to fishing" signs at the lake, the impacts of the anglers appeared to be minimal.

The area was sampled again on 26 September 1989, with no fish caught in a gill net set for two hours, and no "closed to fishing" signs present. No fish were oberved in the lake, but YOY were again captured from the inlet area, indicating that at least some adult fish were present through the spring of 1989.

Overall, it appeared that most of the adult Colorado River cutthroat stocked in Bench Lake in 1987 were gone by September 1989. The reasons for the decline could be due to migrations, low water levels, and/or illegal angler harvest in Bench Lake.

Migrations. Rangers verbally reported that the Bench Lake cutthroats were present in the North Inlet, with anglers catching 12 to 16 inch fish during early August 1989. However, the written creel survey provided by rangers show only 16 cutthroats caught, 12 of which were less than eight inches in length. These small fish do not easily correlate with the cutthroats stocked into Bench Lake that were over 10 inches in length by September 1988.

Cutthroats are the only species present in the North Inlet above the Hallets Creek junction, and it is not unexpected that they are now expanding their range under the protective (10" minimum) fish regulations.

Low Water Levels. If the adult cutthroats (stocked in 1987) rejected the Bench Lake habitat because of harsh conditions, they most likely would have rejected the stream above the lake also. However, the adult fish stocked into Ptarmigan Creek above Bench Lake remain in good numbers, with excellent reproduction occurring since 1988.

Angler Harvest. The Colorado River cutthroats are easily caught, as demonstrated by the fact that all 296 fish moved to Bench Lake were captured by angling with barbless flies. Following the observation of angling occurring at Bench Lake in September 1988, and no "closed to fishing" signs, the area was to be signed again in 1989. These signs did not survive the 1989 angling season, and indicates that some level of angling use did occur at Bench Lake during 1989. Rangers also reported interviewing anglers that intended to fish Bench Lake, and did not know the area was closed to fishing.

In July 1991, only three fish were observed in the inlet bay in 16 hours of observing and fishing. Almost the entire lake was frozen over in October 1992 when over 30 cutthroats were observed below the ice in the inlet area.

Ptarmigan Creek. A total of 653 Yellowstone cutthroats 83 mm to 343 mm in length were removed from Ptarmigan Creek above Bench Lake in 1985, with this area stocked with 91 adult Colorado River cutthroat trout in 1987.

Electrofishing selected pools with 22.1 minutes of current flow on 26 September 1989, produced 15 adult cutthroats that averaged 239 mm. In addition to adults, cutthroats spawned in 1988 (90 mm) and YOY (19 mm) were present in good numbers throughout the hanging valleys above Bench Lake.

Angling surveys of the hanging valleys above Bench Lake conducted in 1991 caught cutthroats ranging in size from 150 mm to 305 mm. The higher meadow was found to have a greater number of smaller fish than the lower meadow. Observations in October 1992 found all age classes including YOY in both meadows.

Current Population Status

Bench Lake. In 1998, unlike previous years, cutthroats were found to be abundant in Bench Lake. Sixty six fish were caught by gill net and angling near the inlet. These fish averaged 251 mm with a size range of 164 mm to 310 mm. Most of the females were flowing eggs.

Twenty four specimens from Bench Lake and Ptarmigan Creek were taken to Don Proebstel (1999) for taxonomic analysis. Don determined:

"Specimens are judged to be "pure" (A) Colorado River cutthroat trout with no detectable morphological difference between the sampling locations. A high degree of variability in spotting patterns within the collections is attributed to similar characteristics of the source population." See Appendix 1 for entire taxonomy report.

In addition to the 24 specimens, 60 tissue samples and video of spotting patterns were taken from both Bench Lake and Ptarmigan Creek. The tissue samples will be used for genetic analysis. Seminal and ovarian fluid samples were also taken for disease testing. Disease results were found to be negative.

In 1999, fish were once again found to be abundant. Thirty cutthroats, averaging 263.9 mm over a size range of 225-305mm, were collected by gill net and hook and line on 13 July. Females caught from the lake were mostly spawned out while fish in the creek were spawning.

Twenty-seven whole fish samples were taken to Robb F. Leary of the University of Montana for taxonomic analysis. Disease testing will also be conducted on the samples by the Colorado Division of Wildlife. Results are not yet available from either testing. Samples for genetics will be collected from Ptarmigan Creek in 2000. It is expected that Bench Lake will be used as a broodstock in the near future if all testing comes out favorably.

Summary of Gill Net Sampling, Bench Lake, Inlet Trend Site, 1981-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/14/81*	Yellowstone	269.00	175-379	0.95	0.20
09/27/88	Colorado River	237.00	237	0.50	0.05
09/26/89	No fish caught in a 2 hour set				

* Overnight net set

Ptarmigan Creek. Female Colorado River cutthroats caught by angling in 1998 were a week behind the Bench Lake females. Forty two fish were caught averaging 198 mm with a size range of 162 mm to 230 mm. Specimens, tissue samples, video, ovarian and seminal samples were also taken from Ptarmigan Creek. No deformities were observed.

Nine fish were also collected from Ptarmigan Creek on 13 July 1999. These fish averaged 230 mm over a size range of 205-270 mm. Spawning was observed throughout the creek.

Angler Use

Due to its inaccessibility Bench Lake was described as having minor visitation in 1964. Bench Lake and Ptarmigan Creek are currently closed to angling. During sampling in 1998 and 1999 fish were very easily caught.

Summary of Creel Survey Data, Bench Lake, 1961-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1961	2.18	9	60.0	Cutthroat
1964	0	2	4.0	
1968	1.22	7	27.0	Cutthroat
1969	0.83	11	29.0	Cutthroat
1976	3.00	1	1.0	Cutthroat
1981	2.67	2	6.0	Cutthroat
1985	Exotic species removed, closed to angling			

Map Bench 1. Location of Bench Lake and Ptarmigan Creek Restoration Habitat, and Antimycin Treatment Sites, 1985.

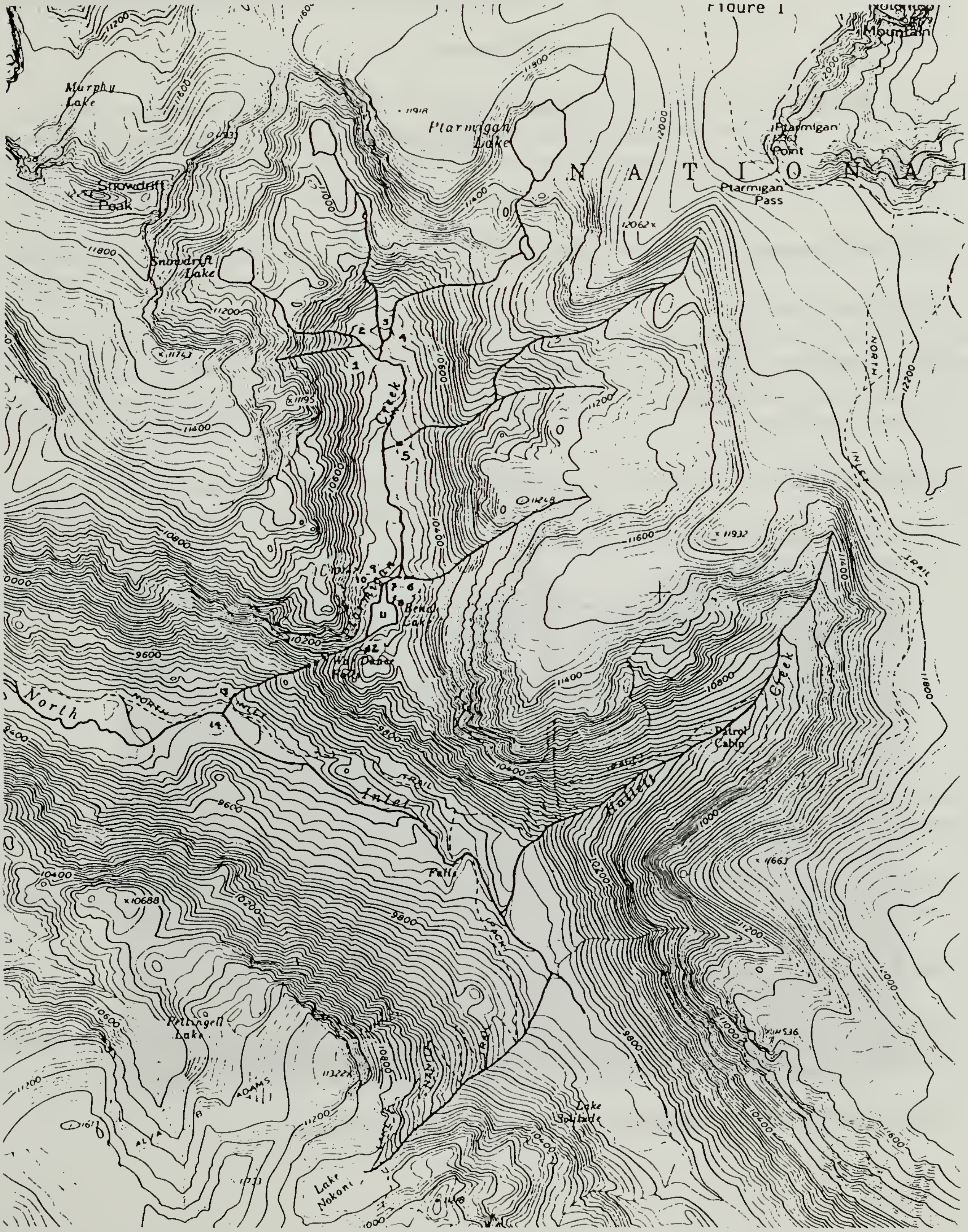


Table Bench 1. Location and Amount of Antimycin Applied to Ptarmigan Creek and Bench Lake, 1985.

Site	Flow/ ACF	Ug/l Antimycin	Time	Units Antimycin
1.	0.5 CFS		4 H	0.05
2. Outlet Snowdrift	0.5 CFS		7 H	0.15
3. Un-named Lake Out.	0.2 CFS		7 H	0.15
4. Ptarm. Lk Outlet	1.5 CFS		8 H	0.31
5. Ptarm. Pass Flow	1.3 CFS		8 H	0.26
6. Flow off Peak	0.8 CFS		8 H	0.17
- Spray to backwater between sites 1 and 6				0.25
11. Bench Lake*	19.0 ACF			2.0
Total				3.6 Units
12. Outlet Kmn04	4.1 CFS	1.5 mg/l	11 H	

Rotenone. In addition to the above antimycin, a lL slug of rotenone was applied to the outlet of Snowdrift Lake at 0900. Rotenone at Ptarmigan meadow by 1100.

* Bench Lake too shallow to allow for effective use of boat. Antimycin applied by spray to shore, constant flow from inlet and slugs to inlet.

Inlet flow 4.1 CFS. Dye placed at site 5 took 2.5 hours to reach Bench Lake.

Started treatment at 0830. Fish dying in upper meadow by 0900 due to slug of antimycin and fast running jugs. Fish dying at site 5 by 1000, and dead fish at outlet of Bench Lake by 1530.

KMn04 run from 1100 to 2230.

OTHER COLORADO RIVER CUTTHROAT TROUT POPULATIONS

Paradise Creek

The Paradise Creek Colorado River cutthroat trout population extends from about half of a mile above the junction with the East Inlet through Paradise Park to a barrier above the junction with the unnamed stream from Adams Lake, a total of 5.6 km. Stocking records show 123,000 "black spotted" fry, 74,640 "black spotted" eggs and 14,000 eyed eggs/fry were stocked from 1925 to 1947.

Specimens were collected from Paradise Park in 1981 and determined to be pure by Eric J. Wagner (1982) of Colorado State University:

"Based on the taxonomic characters, it appears that the trout of Paradise Creek are descendents of Trappers Lake-endemic native crosses. Thus being of pure lineage (Behnke 1979), the pleuriticus of Paradise Creek are pure and should be managed as an "A" population as described by the alphabetic grading system developed by Binns (1977)."

Colorado River cutthroats were observed spawnig in early July 1985 at an elevation of 3,000 m (9,843 ft), as well as in Paradise Park at 3,110 m (10,204 ft).

Paradise Creek Through Paradise Park

Current Population Status

Hook and line surveys conducted at a meadow at 2,940 m (9,646 ft) in 1998 found cutthroats averaging 207 mm with a size range of 142 mm to 272 mm. In 1998 and 1999 hook and line surveys in lower Paradise Park found Colorado River cutthroats to be abundant with several age classes observed. Fish caught averaged 233 mm over a size from 171 mm to 312 mm.

Tissue samples were taken from both locations and given to Don Proebstel for genetic analysis. He determined that the fish in the lower meadow were A- Colorado River cutthroat trout. The fish in Paradise Park were determined to be B Colorado River cutthroat trout with Yellowstone cutthroat trout and rainbow trout influences. The fish showed phenotypic variability based on slides taken at the time of collection and evidence of derivation from multiple sources was also observed.

Angler Use

During collection of samples in early August 1998 two volunteers fishing for a total of about 14 hours caught 14 Colorado River cutthroats in the lower meadow. Three fish were caught in about 2 hours of angling in Paradise Park. No signs of other anglers were apparent at either site. In 1999 4 anglers collecting tissue samples caught 13 cutthroats in 6.5 hours.

Summary of Creel Survey Data, Paradise Creek, 1964-1999

Year	Fish/Hour	# Anglers	Total Hours	Species Reported Caught
1964	0.83	1	6.0	Cutthroat
1965	0.50	4	10.0	Cutthroat
1966	0.93	20	135.0	Cutthroat
1968	2.36	11	95.0	Cutthroat
1969	1.14	28	128.0	Cutthroat, rainbow, brook
1972	0.50	2	4.0	Cutthroat
1975	5.60	4	6.0	Cutthroat
1976	1.25	4	4.0	Cutthroat
1992	4.00	2	2.0	Cutthroat
1999	2.00	4	6.5	Cutthroat

Fifth Lake

Fifth Lake is the highest in a string of lakes along upper East Inlet. It is located at an elevation of 3,312 m (10,867 ft) with a maximum depth of 4.6 m and a surface area of 3 ha. The only mention of stocking appears in a 1961 report by Azevedo and Wallis. They write that the last recorded stocking of cutthroat trout was made in 1938, however no records confirm this stocking. They recommended that Fifth Lake should be restocked every fourth year with 1,500 2-3" cutthroat trout. There are no stocking records that the lake was stocked after this report.

Azevedo and Wallis surveyed Fifth Lake in 1961 and found the population to be small. They observed that the spawning areas available in the inlet and at the head of the outlet were "insufficient in quality and extent to maintain a satisfactory trout fishery." A survey in 1998 found the spawning substrate in the inlet to be great and the inlet temperature to be 4° C on 12 July.

A gill net survey in 1987 found all fish, especially fish >360 mm, in excellent condition with lots of fat around their pyloric caeca. Taxonomic samples were collected and taken to Dr. Behnke (1988). He stated that they were extremely close to being pure cutthroat adding:

"My overall summary and interpretation of the totality of characters of this sample is that the population is predominantly of Trappers Lake ancestry but has been slightly influenced by other parental sources probably including a very slight influence from rainbow trout."

Fifth Lake

Behnke also commented on the diet and the ripeness of the specimens he examined:

"The Fifth Lake fish were in excellent condition with enormous fat deposits around the pyloric caeca. Evidently a large flight of flying ants had landed on this lake shortly before the fish were sampled. Most stomachs were gorged with ants. Small chironomids (2-3 mm larvae, 4 mm adults) made up the bulk of the rest of the diet. One specimen contained numerous stonefly larvae. Evidently feeding conditions are excellent in relation to density of this population. The sample from Fifth Lake was made on July 21. All females contained only immature eggs and no mature unspawned eggs of recent spawning were seen in body cavity. Most likely, with a short growing season, females do not spawn annually. The males had mature, but not turgid testes, indicating recent spawning."

Current Population Status

The last gill net survey was conducted in 1998 with 10 fish caught in a 15.5 hour net set. Several age classes were present and the catch rate was identical to the previous survey conducted in 1987.

Genetic analysis was conducted on tissue samples and meristic characters were analyzed by Don Proebstel from specimens collected in 1998. He determined these fish to be A- Colorado River cutthroat trout with no rainbow trout influence. The down rating from A to A- was based on evidence that this population was derived from multiple sources.

Summary of Gill Net Sampling, Fifth Lake, Outlet Trend Site, 1987-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
07/21/87*	Colorado River	309.87	246-380	0.6	0.28
07/13/98*	Colorado River	278.50	135-420	0.6	0.23

* Overnight net set

Angler Use

Due to its location, almost 15 km from the closest trailhead, Fifth Lake receives little visitation. The only creel data available was collected in 1963 when two anglers fishing for a total of six hours caught seven cutthroat trout.

Columbine Creek

Columbine Creek is the southwesternmost drainage in RMNP. This population was unknown until 1987 when a survey conducted as part of the RMNP Lake and Stream Survey Program discovered it. The section of creek populated by Colorado River cutthroat trout starts above a barrier located at 2,733 m (8,967 ft) and extends 1.1 km through a meadow at 2,780 m (9,121 ft) and becomes barren above the meadow. Known stockings occurred in 1931 and 1938 with a total of 35,000 "black spotted" fry planted.

Specimens were collected in 1987 and taken for taxonomy to Dr. Robert Behnke. Definitive conclusions could not be made based on these specimens because by the time Dr. Behnke (1988) received them they were badly faded, bleached and internally decomposed. The five specimens collected in 1987 averaged 184.2 mm with a range of 151 mm to 220 mm.

Another survey was conducted in 1988 to collect more specimens for taxonomy. A two pass electrofishing survey conducted below the meadow yielded 4.13 fish/100' and 16.5 kg/ha of Colorado River cutthroats. Fish through this section averaged 161 mm with a size range of 87 mm to 227 mm. The meadow was also electrofished with fish averaging 172 mm with a size range of 125 mm to 263 mm.

Based on meristic characters from the 1988 specimens Dr. Behnke (1989) concluded that:

Columbine Creek Through Meadow at 2780 m

"The taxonomic characters of this sample appear to represent a pure population of pleuriticus probably established from one introduction. Their characteristics are distinctly different from the pleuriticus native to the headwaters of the Colorado River in the Park... and from Trapper's Lake."

It is believed that temperature is limiting this population. Good pool habitat exists above the meadow but few fish have been observed through this section. A thermograph was placed in one of the pools located above the meadow in 1999. It will be retrieved in 2000 and the data will be analyzed.

Current Population Status

In 1998, tissue samples were collected for genetic analysis by Don Proebstel from 11 specimens from the meadow and 1 from a pool below the barrier by hook-and-line. Cutthroats in the meadow averaged 184 mm with a size range of 145 mm to 290 mm. All fish were in good shape with no genetic deformities. No fish were observed in the creek between the barrier and the meadow. Based on fish caught by angling, the pool below the barrier was half brook trout and half cutthroats.

Don determined that these fish were A- Colorado River cutthroat trout. They were not considered pure due to evidence that this population was derived from multiple sources and phenotypic variability observed from slides taken at the time of collection.

Angler Use

Columbine Creek is currently closed to angling. The only possible angler reports from this area were from 1967. Four anglers fishing for a total of four hours caught 12 cutthroat trout. During collection of specimens in 1998, three volunteers fishing for a total of about 12 hours caught 11 Colorado River cutthroats in the meadow.

Onahu Creek

The Onahu Creek Colorado River cutthroat trout population extends from a barrier at 3,194 m (10,480 ft) through a series of meadows for 1.6 km to Julian Lake. Julian Lake was stocked with cutthroat trout prior to 1963, but the frequency of stocking is not known. The current Onahu Creek cutthroat population was believed to be founded by these stockings.

A gill net survey conducted on Julian Lake on 20 August 1963 found cutthroats in three age classes, 150 mm to 350 mm (Rosenlund 1979). Due to limited angler use and apparent successful spawning, the lake was not considered for future stocking. Julian Lake was included in a proposal for stocking from 1965 to 1979, however records show no stocking took place during this time. In addition fish were also observed in Onahu Creek below the lake.

A 14 hour gill net survey conducted on 1 August 1979 caught no fish in Julian Lake (Rosenlund 1979). Cutthroats were captured by hook-and-line in two small meadows below the lake. These fish

Onahu Creek Meadow at 3,219 m

were over a size range of 150 mm to 280 mm. Spawning behavior was observed in these meadows at a water temperature of 10.5° C (51° F). This is very late to have successful reproduction.

Another larger meadow is located farther downstream at an elevation of 3,219 m (10,560 ft). Although good fish habitat exists in this meadow, no fish were captured or observed. Reliable reports from RMNP personnel indicate that cutthroats were abundant in this meadow in 1977. A colder drainage of equal size enters Onahu Creek from the east in the middle of this meadow. Water temperatures were measured at 8.7° C at the end of the meadow, compared to 10.5° C in the upper meadow. It was believed that the colder water temperature was to explain for the decline in fish.

Julian Lake was gill netted again in early August 1988 and again no fish were caught in a 11.5 hour set. Five cutthroats were observed in the creek below the lake with two caught by hook-and-line in 15 minutes. These fish measure 260 mm and 288 mm in length. The water temperature was 8.9° C in the creek.

The two fish from the creek were collected and taken to Dr. Behnke for taxonomic analysis. Although it was a small sample size Dr. Behnke concluded (1989):

"The larger specimen has a greenback-like spotting pattern, but with more numerous spots than typical of stomias (more typical of stomias x pleuriticus hybrid). The smaller specimen has a spotting pattern indicative of a rainbow trout influence with spots on top of head (pure cutthroat trout lack spots on top of head). Although these fish do not represent a pure population, the rainbow trout influence is slight and detectable only by spotting pattern…They are overwhelmingly cutthroat trout (mainly stomias x pleuriticus) with a very slight influence of rainbow trout."

Current Population Status

A hook-and-line survey of upper Onahu Creek on 5 August 1999 found the opposite of the 1979 survey. Only three fish were observed in the small meadows just below Julian. One of these fish which appeared very old, 258 mm, was captured. Many fish were observed in the larger meadow, however, they were easily spooked and difficult to catch. Five fish averaging 258 mm in length over a size range of 213 mm to 298 mm were caught. Late afternoon water temperatures in the eastern tributary and in Onahu Creek above and below the tributary were within 1° f of each other. Bear scat was also observed in the area and could explain why fish were so easily spooked.

Another hook-and-line survey on 24 August 1999 found fish easily caught in the lower end of the larger meadow. Nine fish were caught in 15 minutes out of two pools. These fish averaged 219 mm over a size range of 203 mm to 236 mm.

Tissue samples were collected from all 15 cutthroats caught in 1999 and taken to Don Proebstel for genetic analysis. He determined these fish to be A- Colorado River cutthroat trout. They appeared to be derived from multiple sources and phenotypic variability was observed based on pictures and slides taken at the time of collection.

Angler Use

This portion of Onahu Creek is open to angling with a two fish limit. Due to its relative inaccessibility, five miles from closest trailhead with two miles of crosscountry travel, this area receives little angling pressure. No known creel data exists from this area, except for that collected in surveys described above.

Boundary Lake

Boundary Lake is located near the southern boundary of RMNP at the headwaters of Paradise Creek at an elevation of 3318 m. It has a surface area of 0.72 ha and a maximum depth of 3.35 m. The lake was located outside RMNP until a boundary change in 1981 incorporated it into the park. Prior to 1981, it was under fisheries management by the Colorado Division of Wildlife.

One small inlet stream enters the southwest corner of the lake, with a flow of about 0.25 cfs observed during a survey of the lake conducted on 11 August 1981. Although spawning substrate is present in the inlet, water temperatures were measured between 2.5° C and 8° C, which is too cold for successful egg incubation so late in the year. Outlet spawning habitat appeared marginal since the lake drains through a boulderfield before it forms an outlet stream. However, outlet water temperatures were measured between 10.5° C and 13° C which is favorable for spawning success.

Surveys of Boundary Lake in 1961, 1964 and 1968 found it barren despite NPS stocking records showing a plant of 6,800 "black spotted" eyed eggs in 1942. Apparently, from about 1969 up until 1981, Boundary Lake was also stocked with 800 Trappers Lake Colorado River cutthroats at 50 mm in length on odd numbered years.

The 1981 survey found four year classes of fish from stockings in 1975, 1977, 1979 and fry from the 1981 stocking present. Males from the 1979 stocking were mature while the females were immature. The oldest cutthroat captured (390 mm) was evidently from the 1975 stocking and was impacted

Boundary Lake

with eggs that should have been released in 1981.

At the time of the 1981 survey, there was a heavy bloom of zooplankton in Boundary Lake, with most of the fish sampled found to be utilizing zooplankton as a food source, along with Caddis nymphs. One 175 mm cutthroat was found to have eaten one of the 50 mm cutthroats stocked in 1981, that were easily observed along the shores and in the outlet forebay.

Whole fish samples were also collected in 1981 and Eric J. Wagner (1982) from Colorado State University determined; "the spotting and meristic characters all indicate pure pleuriticus and constitute an "A" population" based on these specimens.

Current Population Status

The last gill net survey was conducted in July 1990 with 17 Colorado River cutthroats caught in a half hour net set with no fish under 255 mm (Proebstel 1990). About 10 to 20 fish were observed in outlet area attempting to spawn.

It was originally believed that fish were confined only to the lake. However surveys conducted on 12 July 1999 found fish in an unnamed lake along Paradise Creek about 1.75 km below Boundary Lake. Fish were observed above this lake for about 0.5 km but no fish were observed in a pond below the lake. A gill net survey was conducted on the unnamed lake with 5 cutthroats caught in a 74 minute set. Fish averaged 320 mm over a size range of 303 mm to 336 mm. Females appeared to be spent. Another 295 mm fish was caught by hook and line in the creek above the lake.

Unnamed Lake Below Boundary Lake

Tissue samples were collected from all fish and taken to Don Proebstel for genetic analysis. He determined these fish to be B+ Colorado River cutthroat trout. This rating was based on the presence of Yellowstone cutthroat trout halotypes and evidence of that this population was derived from multiple sources. Additional samples will be collected from this area, as well as Boundary Lake, in 2000.

Summary of Gill Net Sampling, Boundary Lake, Outlet Trend Site, 1981-1999.

Date	Species	Avg. Length (mm)	Range of Length(mm)	Fish/ Net Hour	Kg/Net Hour
08/12/81*	Colorado River	225.74	165-394	0.5	0.11
07/16/90	Colorado River	300.52	255-335	34.0	8.35

* Overnight net set

Angler Use

Due to its remote location, about an eight hour hike from the closest RMNP trailhead, Boundary Lake receives very little visitation. Notes from the 1981 survey indicate that there were old as well as new campsites along the lake indicating some visitor use. The lake is now part of the Paradise Park Research Natural Area and no camping is allowed. No creel survey data has been collected from Boundary Lake.

Upper Colorado River

The existence of this population has been a mystery over the past 30 years. The first discovery of cutthroats in this area occured in 1970 when students of Dr. Robert Behnke, Colorado State University, collected 14 specimens of what Dr. Behnke described as "quite typical of s. c. pleuriticus." (Behnke 1975) The collectors told Dr. Behnke that they left Lulu City where brooks, browns and rainbows were present, traveled up above the river along the Grand Ditch road for about a mile, then descended to what they thought was the Colorado River and found only cutthroat trout.

Surveys were conducted in 1974 and 1975 to refind this cutthroat population. On 12 July 1974, an angling survey was conducted from Lulu City to the confluence of Lady Creek, a distance of about 2 km. In this stretch seven brook trout, 150 mm to 225 mm in length, were caught and another two dozen of about the same size were observed. The stream was clear and flows greatly diminished as

Upper Colorado River Looking Downstream, Lulu City Site is in Meadow

it went upstream. Inasmuch as no barrier(s) to upstream migration to fish could be located, the rapidly decreasing size of the stream as it proceeded upstream, and the severe degredation of the stream and canyon bottom by flooring with rubble and rock from past flooding it was concluded that no Colorado River cutthroats currently existed in the stream and the location of the 1970 cutthroat collection was in error.

On 25 August 1975, the section of the Colorado River from Lady Creek to the Continental Divide was surveyed. Three of the apparently "pure" Colorado River cutthroats were caught amongst a dense population of brook trout. It was concluded that the cutthroats had declined in relative abundance since the early collection in 1970 and that they would eventually disappear.

A survey of the upper Colorado River from the mouth of Little Yellowstone Canyon to Bennett Creek was conducted on 13 September 1979. Electrofishing from the mouth of the canyon to a meadow above the confluence with Specimen Creek yielded only brook trout. Above Specimen Creek fish abundance increased as stream size decreased. At the mouth of Bennett Creek a cyanide tablet was placed in the stream and 38 brook trout and one 115 mm cutthroat were collected. Above Bennett Creek the stream was dry. As part of the RMNP Lake and Stream Survey Program a 300' section of the river was surveyed just downstream of Lady Creek with only brook trout collected.

Based on these survey results it was believed that any Colorado River cutthroats present would soon be totally displaced by brook trout. However, an electrofishing survey, aimed at collecting samples for disease testing, conducted at Lulu City in 1999 captured two cutthroats. These cutthroats represented about 3% of the estimated population in the 370' survey section. Cursory electrofishing between Sawmill Creek and Lulu Creek upstream of Lulu City found cutthroats to make up 6% (3 out of 50 fish sampled) of the fish population in this section.

The most logical explanation for the persistence of the cutthroats in the upper Colorado River is that there is an allopatric cutthroat population above a barrier in one of the western tributaries above the Grand Ditch. It is improbable that the cutthroats that are in the Colorado River itself are reproducing and persisting there since all documented instances of brook trout and cutthroat trout living sympatrically in stream habitat, the brook trout always displace the cutthroats. In addtion, no cutthroat young of the year, which would indicate reproduction is occurring in the Colorado River, have been sampled in this section.

Adding to the mystery of where the cutthroats are residing is the presence of the Grand Ditch. The Grand Ditch is a water development scheme from the late 1800's which funnels water from the west slope of the Continental Divide to the La Poudre drainage on the east slope to be used in the Fort Collins area. The ditch intercepts all of the western tributaries of the Colorado River from Baker Creek to the Continental Divide. Water is not allowed to flow down these streams during the spring and summer months, thus fish populations could not survive below the ditch. During winter months the headgates to the ditch are opened and water, along with fish, is allowed to flow down these streams.

Along with the movement of water comes the movement of fish and other aquatic organisms. At least one population, Willow Creek, of Colorado River cutthroat trout, native to the west slope, is believed to have been established on the east slope within RMNP due to fish transfers via the Grand Ditch.

Small sections of several of these western tributaries, Lulu Creek, Sawmill Creek, Big Dutch Creek, Mosquito Creek, Opposition Creek and Bennett Creek, have been surveyed with no fish observed or sampled in any of them. Hybrid cutthroat trout have been sampled from Baker Creek, where the Grand Ditch begins, in 1975. These fish were examined preliminarily and compared to the previously collected samples from the Colorado River above Lulu City in 1970 by Dr. Behnke (Mullen 1975):

"I suspect some slight non-native influence in Baker Creek trout, but overall they are quite similar. The main features of the trout taken above Lulu City in 1970 were high scale counts ($\bar{x}$ 195) x (45 above lateral line), high basibranchial tooth counts (6-33 x 14), mostly 20, 21 gillrakers, pyloric caeca $\bar{x}$ 37 and with bright coloration. The caeca, gillrakers and tooth counts from Baker Creek are quite similar but 10+ of the 20 had no teeth (possible rainbow influence?). I would have to re-check the scale counts of Baker Creek fish, but it looks like they will average 15-20 lower in the lateral series and about 2 less above the lateral line, which may indicate some non-native influence. Overall, however, I would say they are a good approximation of the original trout of this area, if not absolutely pure."

Baker Creek, as well as the La Poudre drainage where hybrid cutthroats have also been found, could be possible sources of the cutthroat trout in the Colorado River. Fish from these areas and/or the other tributaries could enter the Grand Ditch when it is running and be forced down one of the tributary streams when the ditch is turned off. It is likely that the source of the cutthroat trout is closer to the Continental Divide since all of the cutthroats that have been sampled have been at or above Lulu City.

It is proposed that all of these areas be thoroughly surveyed in 2000 and cutthroats collected and preserved for taxonomic evaluation.

Current Population Status

From the electrofishing survey at Lulu City in 1999, the density of the cutthroat population in the 370' section was 0.54 fish/100' with a biomass estimate of 0.7 kg/ha. This compares to the brook trout population in the same section of 17.56 fish/100' and 57.78 kg/ha.

Angler Use

No creel information is known to exist from this part of the Colorado River.

Willow Creek

Willow Creek is located in the Cache la Poudre River drainage in the northwest portion of RMNP. Although it is located east of the Continental Divide, it contains a population of Colorado River cutthroat trout. There are no barriers in the Willow Creek drainage and brook trout are found with the cutthroats. It's believed that the cutthroats begin at an elevation of 3,170 m (10,400 ft) based on hook and line surveys conducted in 1999. The upper limit of the population is unknown.

The cutthroats are believed to have made it into Willow Creek from the Grand Ditch which drains water from west of the Continental Divide into La Poudre Pass Creek, which is the drainage Willow Creek flows into.

A survey was conducted in 1985 with cutthroats observed as high as 3,294 m (10,807 ft) and brook trout observed in a meadow at 3,196 m (10,486 ft). Cutthroats were found to dominate the

Willow Creek

upper section. Angling found cutthroats to be the majority through the meadow with 7 cutthroats caught averaging 220 mm compared to 6 brook trout caught averaging 189 mm. Samples of the cutthroats were taken to Dr. Robert Behnke for taxonomic examination. Dr Behnke concluded that:

"Considering the lack of physical isolation of Willow Creek and past stocking of cutthroats and rainbows in the upper Poudre, I wouldn't claim Willow Creek to have a pure population, but I can find no evidence of hybridization. I am sure they are pleuriticus, not stomias, based on spotting. They appear very close to the fish in the unnamed tributary to Long Draw Reservoir and may represent original invaders into the upper Poudre via Grand Ditch (probably Baker Creek fish) when upper Poudre was barren above falls."

Dr. Kurt Fausch (1988) of Colorado State University conducted electrofishing surveys at four sites along the creek in 1988. Brook trout and Colorado River cutthroats were found at all sites with brook trout constituting 83% of the fish sampled at the lowest site, 3135 m, and 17% at the highest elevation site, 3294 m. Two passes were conducted at the three lowest sites. Six fish were collected in one pass at the highest site.

Current Population Status

Willow Creek is included in a study to determine the *Effects of Nonnative Brook Trout on Colorado River Cutthroat Trout Populations* (Peterson and Fausch 2000), see Special Studies and Projects section, page 10. In 1998, the first year of the study, a two pass electrofishing survey was conducted on a 1,100 m section of the creek between 3,190 m (10,466 ft) and 3,221 m (10,568 ft) in elevation. Through this section cutthroat density was 1.24 fish/100' and adult (>105 mm) brook trout density was 7.23 fish/100' (Peterson and Fausch 1998). Brook trout ranged in size from 34 mm to 260 mm fork length and Colorado River cutthroats ranged in size from 150 mm to 282 mm fork length with no fish under age 2 sampled. One of Dr. Fausch's 1988 sample sites is included within the 1998 section. Dr. Fausch found brook trout to constitute 30% of the population in his 37 m section, compared to 89% from the 1998 survey. As part of the study all brook trout collected were removed in 1998. The study will continue through 2001 with removal of brook trout taking place each year. Tissue samples were collected for genetic analysis by Don Proebstel.

In 1999 the lowest 950 m of the 1,100 m 1998 survey section was again surveyed using two pass electrofishing. Adult brook trout averaged 198.6 mm fork length with a density 2.89 fish/100' with all fish captured being removed (Peterson and Fausch 2000). Colorado River cutthroats averaged 226 mm fork length with a density of 0.74 fish/100'. In spring prior to the electrofishing survey, two way weirs were installed at the lower and upper ends of the survey section as well as another further downstream to assess movement of fish.

Genetic analysis of samples collected in 1998 by Don Proebstel indicate Yellowstone cutthroat trout influence and phenotypic variability. The Yellowstone influence was large enough that Don would not call these fish Colorado River cutthroats.

Angler Use

The only creel survey data collected from Willow Creek was from 1994 when anglers fishing the lower section of the creek reported catching 43 brook trout/angler hour and 5 cutthroats/angler hour. Anglers fishing the upper section reported catching 18 brook trout/angler hour and 12 cutthroats/angler hour.

OTHER NATIVE FISH SPECIES

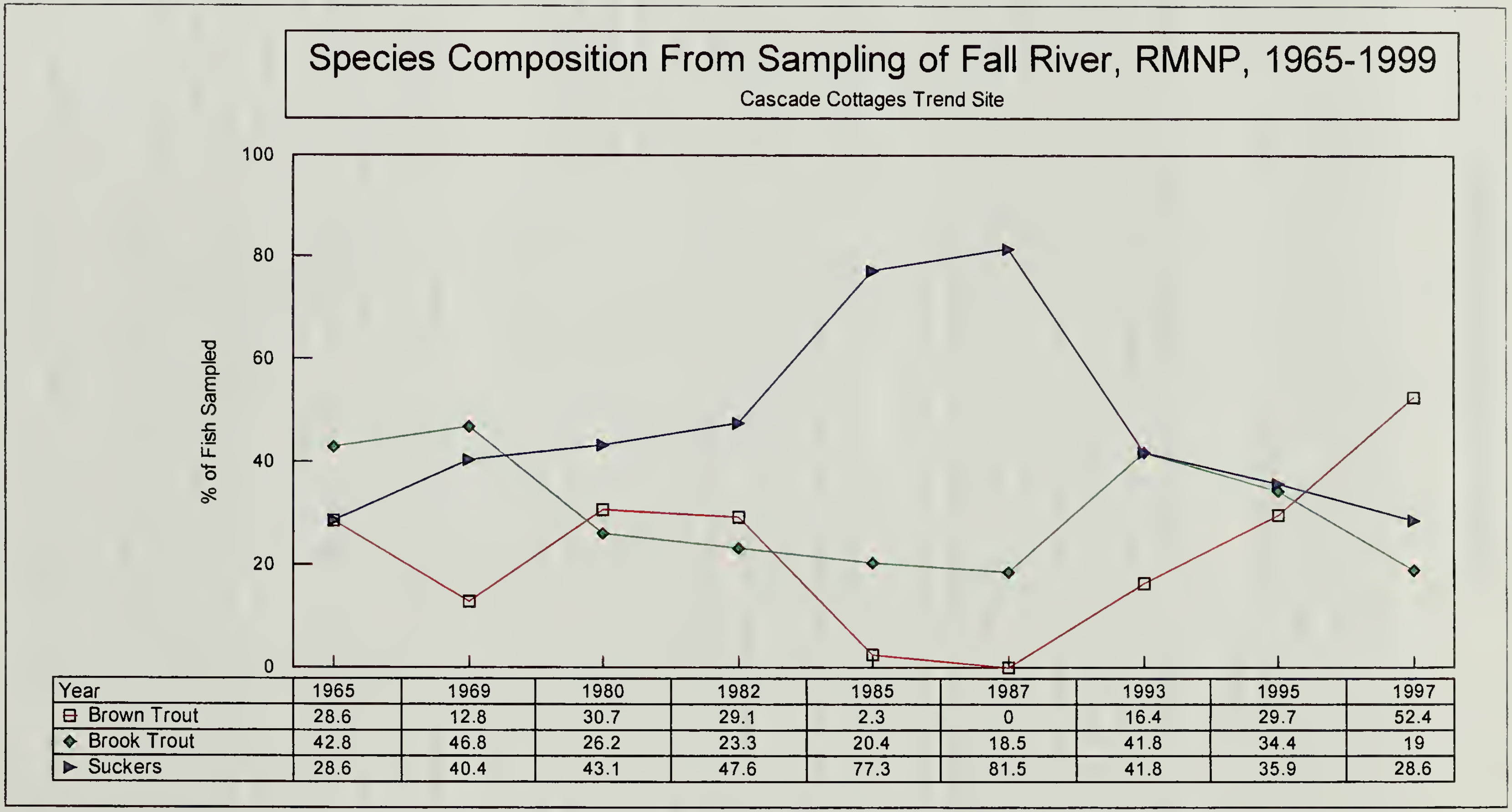
The original distribution of native fish within RMNP was not documented prior to 1925. Stocking of native and non-native fish within RMNP probably began in the late 1800's and ended in 1968. However, stocking is still done in waters just outside RMNP and with no barriers these fish are entering the park. These fish, especially brown trout, are displacing native fish within the lower montane valleys of RMNP.

On the east side of RMNP the white sucker (Catostomus commersoni) and the longnose sucker (Catostomus catostomus), which are both native species, inhabit the Fall River through Horseshoe Park and the Big Thompson River through Moraine Park. Suckers in both of these areas have been in decline in recent years. This decrease has been accompanied by an increase in the number of brown trout present in these waters. There are no records of brown trout being stocked into these waters and no stocking of any species since 1957. It's believed that brown trout, as well as other species of non-native trout, that have been stocked outside RMNP have migrated upstream into the park. It is suspected that the suckers are being preyed upon by the brown trout.

Electrofishing surveys have been conducted on the Fall River near Cascade Cottages dating back to 1965. At that time, suckers and brown trout each accounted for 28.6% of the fish population present at that site, (Figure 6, page 182). Surveys conducted in 1969 and 1980 showed a rise in the sucker population, with suckers constituting 43 % of the species sampled in 1980. Following the Lawn Lake flood in 1982, sucker populations at Cascade Cottages increased due to siltation, which greatly reduced trout spawning habitat. In 1987, suckers constituted 81.5% of the fish population, with no brown trout present. Since 1987, brown trout numbers have increased and sucker numbers have decreased based on electrofishing surveys in 1993, 1995 and 1997. By 1997 brown trout were the dominant species, 52.4% of the population, at this site. An electrofishing survey conducted in 1998 at a site a few hundred feet upstream from the Cascade Cottages trend site found brown trout to be 85.4% of the population, with suckers only 4.7% of the population.

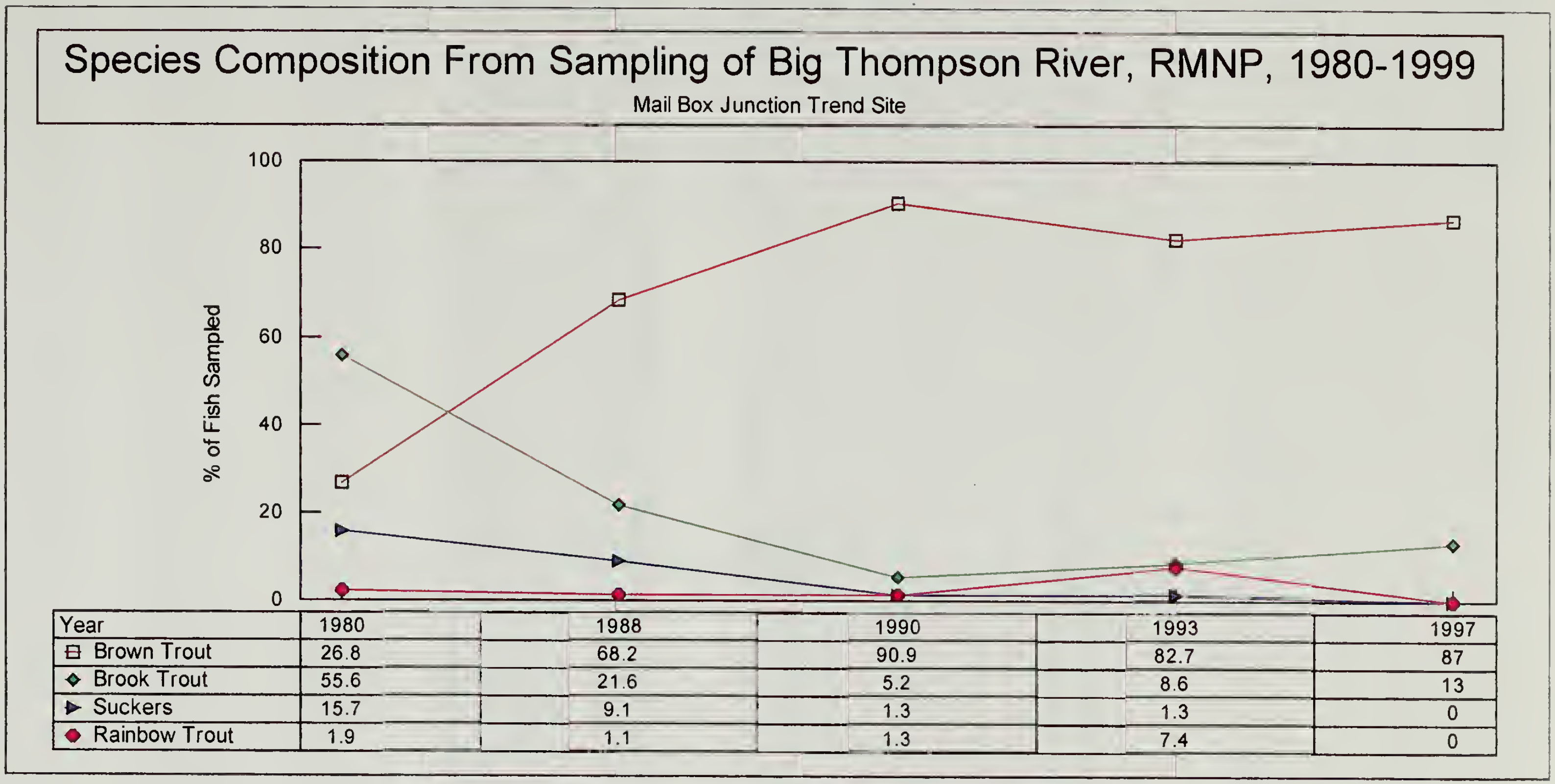
The same situation is also occuring in the Big Thompson River. Electrofishing surveys have been conducted in Moraine Park since 1958. Surveys in 1958 and 1965 found sucker populations around 35% of the species present at several sites, with no brown trout present in 1958. By the fall of 1971 brown trout were found to be the dominant species, constituting 66.2% of the fish population, at two sites. Starting in 1980, a trend site was established at Mailbox Junction, with brook trout found to be the most abundant fish species, followed by brown trout, suckers and rainbow trout (Figure 7, page 183). Since the initial survey at this site, surveys have been conducted in 1988, 1990, 1993 and 1997, with brown trout being the dominant species since 1988. Brown trout have comprised between 68.2% and 92.2% of the fish population at Mailbox Junction in these years. No suckers were sampled in 1990 and 1997, with only one sampled in 1993.

The mottled sculpin, Cottus bairdi, is the only native fish species, other than Colorado River



Year	1965	1969	1980	1982	1985	1987	1993	1995	1997
□ Brown Trout	28.6	12.8	30.7	29.1	2.3	0	16.4	29.7	52.4
◆ Brook Trout	42.8	46.8	26.2	23.3	20.4	18.5	41.8	34.4	19
▶ Suckers	28.6	40.4	43.1	47.6	77.3	81.5	41.8	35.9	28.6

Figure 6



Year	1980	1988	1990	1993	1997
□ Brown Trout	26.8	68.2	90.9	82.7	87
◆ Brook Trout	55.6	21.6	5.2	8.6	13
▶ Suckers	15.7	9.1	1.3	1.3	0
● Rainbow Trout	1.9	1.1	1.3	7.4	0

Figure 7

cutthroat trout, that still inhabit the west side of RMNP. They inhabit the Colorado River from thepark boundary to at least the bridge upstream of Opposition Creek. They have also been found in the stomachs of brown trout in the North Inlet in Summerland Park. The only other fish species that possibly could have been native to the west side of RMNP is the mountain sucker, Catostomus platyrhynchus. One unverified specimen was sampled in a 1972 electrofishing survey. According to John Woodling of the CDOW, in Colorado's Little Fish, A Guide to the Minnows and Other Lesser Known Fishes in the State of Colorado: "Only one record of mountain sucker (Snyder 1981) exists from the upper reaches of the Colorado River system."

An electrofishing survey conducted in 1972 at five sites along the Colorado River found brown trout to be the dominant species, with sculpins "present, but are comparatively scarce as are all prey-size food." Electrofishing surveys have been conducted at two trend sites, Sun Valley Ranch bridge and Never Summer Ranch bridge, since 1980. The Sun Valley site is along the park boundary and the Never Summer site is about 7 miles upstream of Sun Valley. Surveys conducted in 1980, 1988, 1993 and 1997 indicate that sculpins are more abundant at the Never Summer site with the population estimated between 1.3% and 6.6% of the fish population for those years. The accuracy of these numbers is uncertain, due to the small size of sculpins many may be missed during surveys. In 1997, sculpins comprised 1.3 % of fish sampled, while brown trout comprised 93.3% of the sample at the Never Summer site. The figure for sculpins is the lowest since surveys were begun at this site, while the figure for brown trout is the highest for that species. At the Sun Valley site no sculpins were sampled in 1995 or 1997, while brown trout comprised over 92 % of the sample in both of those years.

White suckers and longnose suckers also inhabit the Colorado River, however neither of these fish are native to the west side of RMNP. These species were inadvertantly introduced into western Colorado during the massive trout stocking operations of the late 1800's. Suckers have also been found in Sandbeach Lake, which is at an elevation of 3140 m, Bear Lake, 2890 m, and Hidden Valley Creek during their restorations. The sucker populations in the Colorado River have also decreased as the brown trout populations have increased.

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TABLES

EXPLANATION OF CODES FOR TABLES

Fish Species

GBC	Greenback cutthroat trout
CRC	Colorado River cutthroat trout
YCT	Yellowstone cutthroat trout
CUT	Cutthroat trout of unknown taxonomic affinity
BKT	Brook trout
BNT	Brown trout
RBT	Rainbow trout
LNS	Longnose sucker
WS	White sucker
SCU	Mottled sculpin

Biological Status:

1	Reproducing Type A native fish population existing in the correct drainage. Open to angling.
2	Native fish restoration site. Closed to angling.
3	Reproducing hybrid population (Type B or C), or Type A population in the wrong drainage. Open to angling.
4	Reproducing exotic fish population. Open to angling.
5	Fishless
6	Status unknown
7	Experimental greenback cutthroat trout population. Open to angling.
8	Native cutthroat trout (GBC or CRC) broodstock refugium Closed to angling.
*	Reproduction does not occur every year.

^ Needs additional work, taxonomy, population estimate, etc.

TABLE 1. WATER, HECTARES/KILOMETERS, ELEVATION, YEAR OF LAST SURVEY AND SPECIES PRESENT, RMNP LAKES AND STREAMS, 2000

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
EAST SIDE DRAINAGES					
Big Thompson River					
Arrowhead Lake		13.96	3399.52	1998	GBC(A-)
Aspen Brook		2.81	2606.22	1999	Barren
Azure Lake		5.52	3629.49	1978	Barren
Beaver Brook		9.82	2500.99 *	1986	Barren
Big Thompson River	Below Bear Lake Road	0.64	2403.4	1961	BKT
Big Thompson River	Bear Lake Road to 2477 m, through Moraine Park	4.67	2443.04 *	1997	BNT, BKT, RBT, GBC, WS, LNS
Big Thompson River	2477 m to 2574 m	3.22	2479.65 *	1998	BKT, BNT, RBT, GBC
Big Thompson River	2574 m to 3242 m, through Forest Canyon	12.56	3025.59 *	1980	GBC(A-)
Big Thompson River	Above 3242 m	1.12	3322.97	1980	Barren
Black Canyon Creek	Below 2538 m	2.09	2473.54	1999	BKT
Black Canyon Creek	Above 2538 m	8.21	3022.54	1999	Barren
Black Pool			2760.24		Unknown
Cub Creek		1.93	2552.84		Unknown
Cub Lake		4.04	2635.19	1964	Barren
Doughnut Lake		2.96	3431.24	1987	Barren
Eureka Ditch		1.28	3595.64		Unknown
Fern Creek	Big Thompson River to Fern Falls	0.64	2647.4		Unknown
Fern Creek	Fern Falls to 3056 m	2.25	2805.99 *	1991	GBC(A)
Fern Creek	Above 3056 m	1.77	3242.15		Barren
Fern Lake		3.67	2897.49	1993	GBC(A)
Forest Lake		2.96	3141.49	1964	Barren
Hayden Creek		6.92	3171.99 *	1985	Barren
Hayden Lake		2.96	3403.79	1985	Barren
Helene, Lake		1.11	3232.99	1962	Barren
Hidden River		2.25	3303.15		Unknown
Highest Lake		2.96	3789.62	1960	Barren
Hourglass Lake		3.67	3415.99	1964	Barren
Inkwell Lake		12.12	3507.49	1987	Barren
Irene Lake		0.72	3611.19	1964	Barren
Lily Lake		6.8	2722.73	1999	GBC(A)
Little Rock Lake		0.28	3135.4	1999	CUT(B+)
Lonesome Lake		2.96	3568.49	1964	Barren
Loomis Lake		1.11	3123.19	1995	GBC(A)
Lost Brook		1.44	3005.77		Unknown
Love Lake		0.72	3440.4	1964	Barren
Marigold Lake		0.08	3117.09	1964	Barren
Odessa Lake		4.47	3049.99	1998	GBC(A)
Pool, The			2531.49		BKT, BNT, RBT, GBC
Potts Puddle		1.48	3324.49	1988	Barren
Primrose Lake		0.36	3089.65	1999	GBC(A)
Rainbow Lake		5.16	3580.69	1964	Barren

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
Big Thompson River (continued)					
Rock Lake		2.2	3141.49	1964	CUT(B+)
Sprague Glacier Lake		2.2	3617.29	1964	Barren
Spruce Creek	Big Thompson River to 2769 m	1.28	2665.69	1981	Barren
Spruce Creek	2769 m to 2781 m	0.16	2775.49	1981	BKT
Spruce Creek	Above 2781 m	4.42	3176.26	1981	Barren
Spruce Lake		1.48	2940.19	1995	GBC(A)
Tourmaline Lake		0.72	3220.79	1958	Barren
Unnamed stream	through Windy Gulch	1.93	2682.47		Barren
Unnamed stream	Tourmaline Lake drainage	1.77	3251.29	1998	Barren
Unnamed stream	Lake Helene drainage	0.48	3168.94		Barren
Unnamed stream	Spruce/Loomis Lakes drainage, below 2928 m	0.64	2853.27	1999	Barren
Unnamed stream	Spruce/Loomis Lakes drainage, above 2928 m	0.64	3022.54		GBC(A)
Unnamed stream	Hourglass Lake drainage	1.12	3307.72		Barren
Unnamed stream	Rainbow/Irene Lakes drainage	0.96	3403.79		Barren
Unnamed stream	Lonesome Lake drainage	1.93	3361.09		Barren
Unnamed stream	Hayden Lake drainage	0.64	3300.09		Barren
Unnamed stream	Gorge Lakes drainage, below Arrowhead Lake	2.57	3204.02	1999	CUT(B+)
Unnamed stream	Gorge Lakes drainage, above Arrowhead Lake	1.28	3589.84		Barren
Unnamed stream	Forest Lake drainage	0.48	3128.99		Unknown
Unnamed stream	Doughnut Lake drainage	0.96	3347.37		Barren
Unnamed stream	Fork #13 Big Thompson River	4.02	3277.22	1999	Barren
Wind River	Below 2696 m	1.93	2659.59 *	1986	BKT
Wind River	Above 2696 m	1.29	2726.69	1999	Barren
Glacier Creek					
Andrews Creek		1.61	3316.87		Unknown
Andrews Tarn		0.95	3476.99	1989	Barren
Bear Lake		4.47	2889.87	1986	GBC(A)
Bierstadt Lake		2.96	2866.99	1960	Barren
Black Lake		3.67	3232.99	1987	BKT
Blue Lake		1.11	3397.69	1978	Barren
Boulder Brook	Below 2708 m	1.2	2720.59	1999	BKT, BNT
Boulder Brook	Above 2708 m	7.48	2988.99 *	1986	Barren
Chaos Creek	Glacier Creek to 2952 m	1.44	2854.79		Unknown
Chaos Creek	2952 m to Lake Haiyaha	0.64	3104.9 *	1988	YCT(B)
Chaos Creek	Above Lake Haiyaha	2.25	3327.54		Barren
Dream Lake		2.2	3022.54	1999	GBC(A)
Embryo Lake		0.04	3159.79	1964	Barren
Emerald Lake		2.56	3083.54	1978	Barren
Frozen Lake		2.96	3525.79	1963	Barren
Glacier Creek	Below Prospect Canyon	7.4	2616.9 *	1990	BKT, BNT, RBT, CUT
Glacier Creek	Prospect Canyon to Glacier Falls	2.25	2966.12 *	1979	BKT, RBT

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
Glacier Creek (continued)					
Glacier Creek	Glacier Falls to 3074 m	1.12	3043.28	1999	RBT, BKT, CUT
Glacier Creek	3074 m to 3111 m	0.32	3092.69	1999	CUT(B+), BKT, RBT
Glacier Creek	3111 m to Black Lake	1.12	3171.99	1979	BKT
Glacier Creek	Black Lake to Green Lake	1.61	3377.87		Barren
Glass Lake		1.83	3300.09	1987	GBC(B), BKT
Green Lake		1.48	3531.9	1978	Barren
Haiyaha, Lake		6.24	3117.09	1998	YCT(B)
Icy Brook	Glacier Creek to 3013 m	0.48	2992.04	1998	BKT, BNT
Icy Brook	3013 m to Timberline Falls	1.28	3098.79		GBC(B)
Icy Brook	Timberline Falls to 3315 m	0.48	3249.77		GBC(B), BKT
Icy Brook	3315 m to Sky Pond	0.16	3318.4		BKT
Icy Brook	Above Sky Pond	0.48	3399.22		Barren
Jewel Lake		1.83	3031.69	1979	RBT
Loch, The		5.87	3110.99	1997	GBC(B), BKT
Marigold Pond		0.04	3226.9	1962	Barren
Mill Creek	Below 2599 m	2.41	2488.79 *	1999	BNT, RBT, BKT
Mill Creek	2599 m to 2806 m	2.41	2622.99 *	1999	BKT
Mill Creek	Above 2806 m	4.02	3021.02	1999	Barren
Mills Lake		6.24	3033.22	1995	RBT
Nymph Lake		0.36	2958.49	1961	Barren
Round Pond		0.08	3153.69	1964	Barren
Shelf Creek		2.09	3385.49	1988	Barren
Shelf Lake		1.48	3422.09	1988	Barren
Sky Pond		4.47	3318.4	1978	BKT
Solitude Lake		2.96	3483.09	1963	Barren
Sprague Lake		5.16	2647.4	1961	BKT, RBT, BNT
Two Rivers Lake		1.83	3232.99	1962	Barren
Tyndall Creek	Below 2989 m	0.4	2958.49		Unknown
Tyndall Creek	2989 m to Dream Lake	0.32	3002.72		GBC(A)
Tyndall Creek	Above Dream lake	2.25	3232.99 *	1988	Barren
Unnamed stream	Bierstadt Lake drainage	2.73	2792.27		Barren
Unnamed stream	Bear Lake drainage, below 2879 m	0.64	2824.29		Unknown
Unnamed stream	Bear Lake drainage, above 2879 m	0.16	2891.4		GBC(A)
Unnamed stream	Fork of Andrews Creek, runs through The Gash	0,8	3393.12		Unknown
Unnamed stream	Blue Lake drainage	0.96	3261.97		Barren
Unnamed stream	Frozen Lake drainage	0.64	3387.02		Barren
Cache la Poudre River					
Cache la Poudre River		16.1	3080.49 *	1999	BKT
Cascade Creek	Below Mirror Lake	6.44	3143.02	1981	BKT, BNT
Cascade Creek	Above Mirror Lake	0.64	3405.32		Barren
Chapin Creek		4.83	3171.99 *	1987	BKT

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
Cache la Poudre River (continued)					
Desolation Peaks Lake			3632.54	1964	Barren
Hague Creek	Cache la Poudre River to 3148 m	5.79	3065.24	1999	BKT
Hague Creek	3148 m to 3172 m	0.8	3159.79	1999	CUT(A-)
Hague Creek	Above 3172 m	4.83	3403.79	1998	Barren
Hazeline Lake		2.96	3388.54	1990	Barren
La Poudre Pass Creek	Below Long Draw Reservoir	5.63	3027.73		Unknown
La Poudre Pass Creek	Above Long Draw Reservoir	2.25	3092.69	1988	CUT
Mirror Lake		8.4	3361.09	1991	BKT, BNT
Mummy Pass Creek	Below 3306 m	1.93	3200.97	1997	BKT
Mummy Pass Creek	Above 3306 m	1.28	3367.19	1997	Barren
Poudre Lake		5.52	3281.79	1960	BKT
Unnamed ditch	Runs from Specimen Creek to La Poudre Pass	2.57	3124.11		Unknown
Unnamed lake	Lowest above Hazeline Lake		3449.54	1964	Barren
Unnamed lake	2nd lowest above Hazeline Lake		3461.74	1964	Barren
Unnamed lake	3rd lowest above Hazeline Lake		3476.99	1964	Barren
Unnamed lake	Highest above Hazeline Lake		3507.49	1964	Barren
Unnamed lake	On fork #4 Hague Creek, lowest		3507.49	1964	Barren
Unnamed lake	On fork #4 Hague Creek, middle		3510.54	1964	Barren
Unnamed lake	On upper Hague Creek		3473.94	1998	Barren
Unnamed stream	Hazeline Lake drainage, below 3062 m	0.16	3053.04	1999	BKT, CUT(B+)
Unnamed stream	Hazeline Lake drainage, 3062 m to 3111 m	0.16	3086.59	1999	CUT(B+)
Unnamed stream	Hazeline Lake drainage, above 3111 m	2.89	3316.87	1998	Barren
Unnamed stream	Fork of Mummy Pass Creek, below 3294 m	0.32	3277.22	1997	BKT
Unnamed stream	Fork of Mummy Pass Creek, above 3294 m	1.12	3383.97	1997	Barren
Unnamed stream	Desolation Peaks Lake drainage	2.73	3487.67		Barren
Willow Creek	Below 3184 m	4.99	3098.79	1999	BKT
Willow Creek	Above 3184 m	3.22	3205.54 *	1999	CUT(B+), BKT
Fall River					
Bighorn Creek		3.38	2561.99 *	1986	Barren
Caddis Lake		0.28	3278.74	1999	GBC(A)
Chipmunk Lake		0.04	3248.24	1961	Barren
Chiquita Creek		4.67	2988.99 *	1984	Barren
Chiquita Lake		1.48	3461.74	1988	Barren
Crystal Lake		9.92	3513.59	1998	GBC(A)
Fall River	Below point S of Sheep Lakes	3.22	2577.24 *	1997	BNT, LNS, BKT
Fall River	Point S of Sheep Lake to Fan Lake	1.61	2592.49 *	1998	BKT, BNT, GBC, RBT
Fall River	Fan Lake to Chasm Falls	3.54	2647.4 *	1998	BKT
Fall River	Chasm Falls to 2879 m	1.93	2758.72 *	1957	CUT, BKT, RBT
Fall River	Above 2879 m	5.79	3248.24 *	1998	Barren
Fan Lake			2607.74	1993	GBC, BKT

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
Fall River (continued)					
Fay Lake		1.83	3361.609	1988	Barren
Faylene Lake		1.83	3419.04	1961	Barren
Hidden Valley Creek	Fall River to 2727 m	1.12	2658.07		Unknown
Hidden Valley Creek	2727 m to 2806 m	2.89	2766.34	1998	BKT, GBC(A), BNT
Hidden Valley Creek	Above 2806 m	3.38	3135.4	1998	Barren
Iceberg Lake		0.08	3656.94	1964	Barren
Lawn Lake		7.99	3354.99	1996	GBC(A)
Little Crystal Lake		1.48	3510.54	1982	Barren
Roaring River	Fall River to Horseshoe Falls	0.48	2546.74 *	1998	BKT, GBC, BNT, RBT
Roaring River	Horseshoe Falls to 2804 m	2.09	2798.37 *	1991	GBC(A)
Roaring River	Above 2804 m	5.79	2927.99 *	1989	GBC(A)
Sheep Lakes	N		2598.59	1990	Barren
Sheep Lakes	S		2594.94	1990	Barren
Spectacle Lakes	Lower	2.96	3461.74	1961	Barren
Spectacle Lakes	Upper	4.47	3476.99	1961	Barren
Sundance Creek	Below Thousand Falls	0.32	2683.99	1984	BKT
Sundance Creek	Above Thousand Falls	3.54	3129.29	1984	Barren
Unnamed lake	On Hidden Valley Creek, ABC Meadow		2738.9	1998	BKT, GBC(A)
Unnamed lake	On Hidden Valley Creek, boardwalk, lowest		2784.65		BKT, GBC(A)
Unnamed lake	On Hidden Valley Creek, boardwalk, 2nd lowest		2784.65	1998	BKT, GBC(A)
Unnamed lake	On Hidden Valley Creek, boardwalk, 3rd lowest		2784.65	1998	BKT, GBC(A)
Unnamed lake	On Hidden Valley Creek, boardwalk, highest		2787.69		BKT, GBC(A)
Unnamed stream	W branch of Hidden Valley Creek, near Fall River jct	0.8	2659.59	1998	Barren
Unnamed stream	Fay Lakes drainage, below 3111 m	0.32	3100.32		CRC(B+)
Unnamed stream	Fay Lakes drainage, 3111 m to 3300 m	1.28	3205.54	1999	GBC(A)
Unnamed stream	Fay Lakes drainage, above 3300 m	2.25	3537.99		Barren
Unnamed stream	Spectacle Lakes drainage	0.48	3368.72	1998	Barren
Ypsilon Creek	Below 3172 m	2.41	3049.99 *	1999	CRC(B+)
Ypsilon Creek	3172 m to Ypsilon Lake	0.32	3196.4		CRC(A-)
Ypsilon Creek	Above Ypsilon Lake	1.12	3338.22	1979	Barren
Ypsilon Lake		2.96	3214.69	1998	CRC(A-)
North Fork Big Thompson River					
Cow Creek	Below Bridal Veil Falls	3.86	2574.19	1999	BKT, BNT
Cow Creek	Above Bridal Veil Falls	4.5	3031.69		Unknown
Dunraven, Lake		4.47	3464.79	1969	Barren
Fox Creek		5.15	3013.4 *	1984	Barren
Gem Lake		0.08	2693.15	1964	Barren
Grouse Creek		2.25	3324.49 *	1984	Barren
Husted, Lake		4.04	3367.19	1998	GBC(A)
Lost Lake		3.67	3275.69	1998	GBC(A)
Louise, Lake		2.56	3367.19	1998	GBC(A)

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
North Fork Big Thompson River (continued)					
North Fork Big Thompson River	Below Lost Falls	4.83	2859.37	1998	BKT, BNT, GBC(A)
North Fork Big Thompson River	Lost Falls to 3367 m	4.67	3293.99 *	1986	GBC(A)
North Fork Big Thompson River	Above 3367 m	3.38	3679.82	1958	Barren
Rowe Glacier Lake		2.96	3995.49	1970	Barren
Unnamed lake	On NF Big Thompson River, below Lake Dunraven, upper		3351.94	1984	GBC(A)
Unnamed lake	On NF Big Thompson River, below Lake Dunraven, lower		3348.9		GBC(A)
Unnamed lake	On NF Big Thompson River, above Lake Dunraven, lower	1.32	3519.69	1958	Barren
Unnamed lake	On NF Big Thompson River, above Lake Dunraven, upper	1.11	3544.09	1958	Barren
Unnamed stream	Lost Lake drainage	0.96	3238.18		GBC(A)
Unnamed stream	Lake Louise drainage	0.48	3358.04		GBC(A)
West Creek	Below West Creek Falls	0.48	2468.97	1999	BKT, GBC(A)
West Creek	West Creek Falls to 2720 m	3.05	2622.99 *	1999	GBC(A)
West Creek	Above 2720 m	6.28	2720.59	1998	Barren
North St. Vrain Creek					
Bluebird Lake		8.8	3348.28	1979	Barren
Box Lake		2.56	3281.79	1980	BKT
Campers Creek		3.05	2927.99 *	1985	Barren
Castle Lake		0.72	3403.79	1964	Barren
Castle Lakes	S of Castle Lake, W		3239.09		Unknown
Castle Lakes	S of Castle Lake, E		3239.09		Unknown
Chickadee Pond		0.36	3053.04	1964	Barren
Cony Creek	North St Vrain Creek to Calypso Cascades	0.48	2773.97		Unknown
Cony Creek	Calypso Cascades to Upper Hutcheson Lake	5.79	3110.99 *	1989	GBC(A)
Cony Creek	Above Upper Hutcheson Lake	0.8	3463.57	1998	Barren
Cony Lake		6.6	3511.15	1998	Barren
Copeland Lake			2537.9	1992	RBT, BKT
Eagle Lake		4.76	3306.19	1980	Barren
Falcon Lake		1.83	3373.29	1964	Barren
Finch Lake		2.96	3022.54	1981	Barren
Fox Creek		5.15	2708.4 *	1985	Barren
Frigid Lake		4.76	3598.99	1964	Barren
Horse Creek		2.57	2757.19 *	1985	Barren
Hunters Creek	North St Vrain Creek to 2623 m	0.16	2604.69		Unknown
Hunters Creek	2623 m to Lyric Falls	2.89	2972.22 *	1999	GBC(A)
Hunters Creek	Lyric Falls to Keplinger Lake	3.86	3335.17		Barren
Hutcheson Lakes	Lower	1.71	3309.86	1998	GBC(A)
Hutcheson Lakes	Middle	0.99	3373.29	1998	GBC(A)
Hutcheson Lakes	Upper	2.96	3415.99	1998	GBC(A)
Indigo Pond		0.28	3403.79	1964	Barren
Isolation Lake			3659.99		Unknown
Junco Lake		3.67	3242.15	1964	Barren

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
North St. Vrain Creek (continued)					
Keplinger Lake		3.67	3564.23	1963	Barren
Lake of Many Winds		0.36	3541.04	1964	Barren
Lark Pond		1.83	3452.59	1963	Barren
Lion Lake No. 1		2.96	3374.82	1999	Barren
Lion Lake No. 2		1.48	3476.99	1980	Barren
North St Vrain Creek	Below Copeland Falls	2.41	2531.49 *	1997	BNT, BKT, CUT
North St Vrain Creek	Copeland Falls to Falcon Lake	9.01	2982.9	1998	BKT, CUT, BNT
Ouzel Creek	North St Vrain Creek to Ouzel Falls	0.48	2836.49		Unknown
Ouzel Creek	Ouzel Falls to 2989 m	1.44	2952.4 *	1998	BKT, GBC(A)
Ouzel Creek	2989 m to 3087 m	1.12	3062.19 *	1998	BKT, GBC(A)
Ouzel Creek	3087 m to 3233 m	0.96	3159.79	1984	GBC(A)
Ouzel Creek	Above 3233 m	1.12	3358.04		Barren
Ouzel Lake		2.56	3080.49	1998	GBC(A), BKT
Pear Creek		1.12	3179.92		GBC(A)
Pear Lake		6.6	3226.9	1998	GBC(A)
Pipit Lake		5.16	3476.99	1961	Barren
Sandbeach Creek	North St Vrain Creek to 2660 m	0.4	2633.67		Unknown
Sandbeach Creek	2660 m to 2745 m	0.64	2702.3	1999	GBC(B+)
Sandbeach Creek	2745 m to 3135 m	2.57	2940.19	1999	GBC(A-)
Sandbeach Creek	3135 m to Sandbeach Lake	0.16	3138.44	1998	GBC(A)
Sandbeach Lake		6.6	3141.49	1998	GBC(A)
Snowbank Lake		2.96	3513.9	1980	Barren
Thunder Lake		6.6	3225.06	1998	CUT(B), BKT
Twin Lakes	E, aka Radcliff Ponds	0.72	3010.34	1980	Barren
Twin Lakes	W, aka Radcliff Ponds	1.83	2979.84	1980	Barren
Unnamed stream	Junco Lake drainage	1.93	3541.04		Barren
Unnamed stream	Lion Lakes drainage, below Thunder Falls	1.12	3246.72	1999	BKT
Unnamed stream	Lion Lakes drainage, above Thunder Falls	2.25	3469.37	1999	Barren
Unnamed stream	Eagle Lake drainage, below Martensia Falls	0.4	3123.19		Unknown
Unnamed stream	Eagle Lake drainage, Martensia Falls to 3233 m	0.48	3202.49		BKT
Unnamed stream	Eagle Lake drainage, above 3233 m	1.2	3419.04		Barren
Unnamed stream	Box Lake drainage	0.64	3240.62		BKT
Unnamed stream	Indigo Pond drainage	1.12	3350.42		Barren
Unnamed stream	Lake of Many Winds drainage	1.61	3385.49	1998	Barren
Unnamed stream	Fork #11 North St Vrain Creek, below Fan Falls	0.48	3336.69		Unknown
Unnamed stream	Finch Lake drainage	0.16	3028.65	1988	Barren
Roaring Fork/Cabin Creek					
Alpine Brook		4.99	3042.37	1985	Barren
Cabin Creek	Below 2867 m	1.93	2714.49 *	1985	BKT
Cabin Creek	Above 2867 m	2.41	3251.29		Unknown
Chasm Lake		7.72	3586.79	1985	Barren

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
Roaring Fork/Cabin Creek (continued)					
Inn Brook		3.22	2926.47	1985	Barren
Larkspur Creek		0.96	3272.65	1985	Barren
Peacock Pool		1.83	3434.29	1972	BKT
Roaring Fork	Below 3453 m	7.56	2978.32	1985	BKT
Roaring Fork	Above 3453 m	0.8	3514.51		Barren
South Fork Cache la Poudre River					
South Fork Cache la Poudre River	Below 2879 m	0.16	2876.15	1999	GBC(A)
South Fork Cache la Poudre River	Above 2879 m	7.89	3452.59		Barren
WEST SIDE DRAINAGES					
Colorado River, Lower					
Colorado River	Below Shadow Mountain Dam	2.25	2539.12	1989	BKT, BNT, LNS, SCU
Columbine Creek	Colorado River to 2733 m	2.09	2601.65		BKT
Columbine Creek	2733 m to 2794 m	1.12	2781.59 *	1998	CRC(A-)
Columbine Creek	Above 2794 m	3.86	3080.49	1998	Barren
Pole Creek		2.41	2439.99 *	1987	Barren
Ranger Creek		2.57	2561.99 *	1987	Barren
Colorado River, Upper					
Baker Creek		4.02	2680.94	1999	BKT, BNT
Beaver Creek		5.47	3037.79	1972	BKT
Bennett Creek		2.89	3126.24 *	1987	Barren
Big Dutch Creek		3.86	3138.44	1975	Barren
Bighorn Lake		0.36	3333.65	1962	Barren
Chickaree Lake		1.83	2833.44	1964	Barren
Colorado River	Park boundary to gaging station at 2672 m	10.46	2641.29 *	1997	BNT, BKT, LNS, RBT, WS, SCU
Colorado River	Gaging station at 2672 m to 2806 m	14.09	2708.4 *	1997	BNT, BKT, SCU
Colorado River	Above 2806 m	5.63	2848.69 *	1999	BKT, CRC(A)
Grand Ditch		23.35	3158.57	1988	CUT, BNT
Green Valley Stream		3.22	2761.77	1988	Barren
Irene, Lake		0.28	3232.99	1968	Barren
Julian Lake		2.2	3385.49	1988	Barren
Lady Creek		1.28	3098.79	1988	Barren
Lake of the Clouds		4.47	3486.15	1986	Barren
Little Dutch Creek		1.61	3004.24	1988	Barren
Lost Creek		1.44	2995.09	1988	Barren
Lulu Creek		4.34	3116.48	1975	Barren
Middle Dutch Creek		0.8	3071.34		Unknown

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
Colorado River, Upper (continued)					
Mosquito Creek		3.54	3222.32	1975	Barren
Onahu Creek	Colorado River to 2745 m	4.18	2668.74 *	1998	BKT, BNT, SCU
Onahu Creek	2745 m to 3196 m	5.23	2970.69	1987	BKT
Onahu Creek	3196 m to 3294 m	1.12	3245.19	1999	CRC(A-)
Onahu Creek	3294 m to Julian Lake	0.64	3332.12	1999	CRC(A-)
Opposition Creek		3.54	3222.32	1975	Barren
Phantom Creek		3.22	3184.19 *	1986	Barren
Pinnacle Pool		1.44	3446.49	1964	Barren
Sawmill Creek		5.31	3228.42	1999	Barren
Specimen Creek		3.38	3171.99 *	1987	Barren
Squeak Creek		4.18	3196.4 *	1986	Barren
Timber Creek	Below 2867 m	0.96	2720.59 *	1997	BKT
Timber Creek	Above 2867 m	4.18	3281.79 *	1986	CRC(A)
Timber Lake		4.04	3373.29	1998	CRC(A)
Unnamed lake	On Beaver Creek, near Colorado River jct., highest		2743.47	1972	BKT
Unnamed lake	On Big Dutch Creek, below Lake of the Clouds		3263.49	1986	Barren
Unnamed stream	Fork #4 Onahu Creek, through Long Meadows	2.25	3069.21		Unknown
Unnamed stream	Runs out of Bowen Gulch	0.8	2683.99		BKT, BNT, SCU, WS, RBT
Unnamed stream	Runs through Red Gulch, below 2782 m	0.4	2754.15	1988	BKT
Unnamed stream	Runs through Red Gulch, above 2782 m	3.22	3095.74		Unknown
Unnamed stream	Runs through Crater Gulch	3.38	2818.19 *	1986	Barren
Unnamed stream	South of La Poudre Pass Lake	2.09	3242.15	1979	Barren
East Inlet					
Adams Lake		1.83	3419.04	1981	CRC(A)
Boundary Lake		0.72	3318.4	1990	CRC(A)
East Inlet	Below Adams Falls	0.16	2583.34	1995	BNT, BKT
East Inlet	Adams Falls to falls at 2745 m	4.18	2664.17	1999	BKT
East Inlet	Falls at 2745 m to 3294 m	5.79	3019.49		BKT
East Inlet	3294 m to Fifth Lake	0.16	3298.57		CRC(A-)
East Inlet	Above Fifth Lake	0.8	3451.07		Barren
Echo Creek	Below 2928 m	1.77	2622.99 *	1987	BKT
Echo Creek	Above 2928 m	2.81	2927.99 *	1987	Barren
Fifth Lake		2.96	3312.29	1998	CRC(A-)
Fourth Lake		2.96	3168.94	1992	BKT
Lone Pine Lake		5.16	3014.92	1973	BKT
Paradise Creek	East Inlet to 2904 m	0.8	2859.37		Unknown
Paradise Creek	2904 m to 3026 m	1.93	2921.9 *	1998	CRC(A-)
Paradise Creek	3026 m to 3172 m, through Paradise Park	3.7	3098.79	1999	CRC(B)
Paradise Creek	3172 m to Boundary Lake	2.41	3242.15	1999	CRC(B+)
Spirit Lake		7.35	3138.44	1992	BKT, CRC(A)
Ten Lake Park Lake		4.87	3415.99	1987	CRC(C)

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
East Inlet (continued)					
Unnamed lake	On fork #4 Paradise Creek, lowest		3344.32	1981	Barren
Unnamed lake	On fork #4 Paradise Creek, 2nd lowest		3356.52	1981	Barren
Unnamed lake	On fork #4 Paradise Creek, 3rd lowest		3370.24	1981	Barren
Unnamed lake	On fork #4 Paradise Creek, highest		3373.29	1981	Barren
Unnamed lake	On Paradise Creek, between forks #4 and #5		3211.65	1999	CRC(B+)
Unnamed pond	NE of Mt. Adams, large	1.28	3364.15	1981	Barren
Unnamed stream	Adams Lake drainage	2.09	3248.24	1981	CRC(A)
Verna, Lake		13.24	3110.99	1973	BKT
North Inlet					
Bench Lake		2.56	3095.74	1999	CRC(A)
Hallett Creek		3.38	2958.49 *	1991	Barren
Nanita, Lake		13.6	3290.94	1980	CRC(A)
Nokoni, Lake		9.96	3287.9	1987	Barren
North Inlet	Below Cascade Falls	4.02	2592.49 *	1995	BNT, BKT, SCU
North Inlet	Cascade Falls to falls at 2891 m	6.44	2787.69	1992	CRC(B), BKT
North Inlet	Falls at 2891 m to 3026 m	3.7	2952.4 *	1999	CRC(B)
North Inlet	3026 m to Lake Powell	2.81	3269.59	1987	Barren
Pettingell Lake		4.04	3205.54	1999	CUT(B+)
Powell, Lake		5.16	3522.74	1987	Barren
Ptarmigan Creek	North Inlet to War Dance Falls	0.64	2912.74		Unknown
Ptarmigan Creek	War Dance Falls to 3172 m	1.93	3080.49	1999	CRC(A)
Ptarmigan Creek	Above 3172 m	1.61	3403.79		Barren
Ptarmigan Lake		8.44	3495.29	1984	Barren
Snowdrift Lake		3.67	3403.79	1984	Barren
Solitude, Lake		2.96	2964.59	1999	CRC(B)
Unnamed lake	Source of fork #4 of Ptarmigan Creek		3376.34	1984	Barren
Unnamed lake	On Ptarmigan Creek, below Ptarmigan Lake		3409.9	1984	Barren
Unnamed lake	On fork #15 North Inlet, upper, larger		3229.94	1987	Barren
Unnamed lake	On fork #15 North Inlet, lower, smaller		3168.94	1987	Barren
Unnamed lake	On North Inlet, below fork #16		3278.74	1987	Barren
Unnamed lake	On North Inlet, below Lake Powell		3483.09	1987	Barren
Unnamed stream	Pettingell Lake drainage	2.25	2960.02	1999	Barren
Unnamed stream	Snowdrift Lake drainage, below 3172 m	0.16	3159.79		CRC(A)
Unnamed stream	Snowdrift Lake drainage, above 3172 m	0.8	3280.27		Barren
Unnamed stream	Fork #4 Ptarmigan Creek, below 3172 m	0.16	3165.9		CRC(A)
Unnamed stream	Fork #4 Ptarmigan Creek, above 3172 m	0.96	3268.07		Barren
Unnamed stream	Lake Nokoni drainage	1.44	3119.53		Unknown
Unnamed stream	Lake Nanita drainage, below 3282 m	1.12	3124.72		Unknown
Unnamed stream	Lake Nanita drainage, 3282 m to Lake Nanita	0.24	3290.94		CRC(A)
Unnamed stream	Lake Nanita drainage, above Lake Nanita	0.64	3326.02		Barren
Unnamed stream	Fork #15 North Inlet	2.01	3203.41	1987	Barren

TABLE 1. CONTINUED

Water	Location	Hectares/ Kilometers	Mean Elevation(m) or * Survey Elevation(m)	Year of Last Survey	Species
Tonahutu Creek					
Harbison Ditch		2.25	2683.99		Unknown
Haynach Lakes	Lake on fork #7 Tonahutu Creek, upper, larger	2.56	3379.4	1999	YCT(B)
Haynach Lakes	Lake on fork #7 Tonahutu Creek, lower , smaller		3364.15	1999	YCT(B)
Haynach Lakes	2 of 6 ponds		3446.49	1999	Barren
Haynach Lakes	3 of 6 ponds		3446.49	1999	Barren
Haynach Lakes	1 of 6 ponds		3385.49		Unknown
Haynach Lakes	5 of 6 ponds		3339.74	1999	YCT(B)
Haynach Lakes	6 of 6 ponds		3278.74	1999	Barren
Haynach Lakes	4 of 6 ponds		3449.54	1999	Barren
Murphy Lake		2.96	3422.09	1986	Barren
Tonahutu Creek	Below 2733 m	1.77	2622.99 *	1995	BKT, BNT, CRC
Tonahutu Creek	2733 m to Granite Falls	6.28	2879.19 *	1988	BKT, CRC
Tonahutu Creek	Granite Falls to 3099 m	2.25	3043.9	1957	CRC
Tonahutu Creek	Above 3099 m	2.01	3200.97	1999	Barren
Unnamed lake	On Tonahutu Creek, near headwaters		3263.49	1999	Barren
Unnamed stream	Murphy Lake drainage	1.61	3257.4	1999	Barren
Unnamed stream	Fork of Fork #6 Tonahutu Creek	1.12	3354.99	1999	Barren
Unnamed stream	Haynach Lakes drainage	2.41	3235.44	1999	YCT(B)
Unnamed stream	Fork #8 Tonahutu Creek	2.09	3312.29	1999	Barren
Unnamed stream	Fork #9 Tonahutu Creek	1.28	3441.92	1999	Barren

TABLE 2. WATER, YEAR OF LAST SURVEY, SPECIES PRESENT, AVERAGE LENGTH, FISH PER 100'/NET HOUR AND KG/HA, RMNP LAKES AND STREAMS, 2000

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
EAST SIDE DRAINAGES						
Big Thompson River						
Arrowhead Lake		1998	GBC(A-)	318.18	4.33	
Aspen Brook		1999	Barren			
Azure Lake		1978	Barren			
Beaver Brook		1986	Barren			
Big Thompson River	Below Bear Lake Road	1961	BKT			
Big Thompson River	Bear Lake Road to 2477 m, through Moraine Park	1997	BNT	212.98		72.46
			BKT	87.54		1.34
			RBT			
			GBC			
			WS			
			LNS			
Big Thompson River	2477 m to 2574 m	1998	BKT	185.6		
			BNT	180.7		
			RBT	174		
			GBC			
Big Thompson River	2574 m to 3242 m, through Forest Canyon	1980	GBC(A-)	183	28.4	
Big Thompson River	Above 3242 m	1980	Barren			
Black Canyon Creek	Below 2538 m	1999	BKT			
Black Canyon Creek	Above 2538 m	1999	Barren			
Black Pool			Unknown			
Cub Creek			Unknown			
Cub Lake		1964	Barren			
Doughnut Lake		1987	Barren			
Eureka Ditch			Unknown			
Fern Creek	Big Thompson River to Fern Falls		Unknown			
Fern Creek	Fern Falls to 3056 m	1991	GBC(A)	149.96	6.84	24.19
Fern Creek	Above 3056 m		Barren			
Fern Lake		1993	GBC(A)	256.85	7	
Forest Lake		1964	Barren			
Hayden Creek		1985	Barren			
Hayden Lake		1985	Barren			
Helene, Lake		1962	Barren			
Hidden River			Unknown			
Highest Lake		1960	Barren			
Hourglass Lake		1964	Barren			
Inkwell Lake		1987	Barren			
Irene Lake		1964	Barren			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Big Thompson River (continued)						
Lily Lake		1999	GBC(A)	310.33	18	
Little Rock Lake		1999	CUT(B+)	292		
Lonesome Lake		1964	Barren			
Loomis Lake		1995	GBC(A)	211	13	
Lost Brook			Unknown			
Love Lake		1964	Barren			
Marigold Lake		1964	Barren			
Odessa Lake		1998	GBC(A)	271.9	10	
Pool, The			BKT			
			BNT			
			RBT			
			GBC			
Potts Puddle		1988	Barren			
Primrose Lake		1999	GBC(A)	223.63		
Rainbow Lake		1964	Barren			
Rock Lake		1964	CUT(B+)			
Sprague Glacier Lake		1964	Barren			
Spruce Creek	Big Thompson River to 2769 m	1981	Barren			
Spruce Creek	2769 m to 2781 m	1981	BKT	228.75		
Spruce Creek	Above 2781 m	1981	Barren			
Spruce Lake		1995	GBC(A)	253.16	14.63	
Tourmaline Lake		1958	Barren			
Unnamed stream	through Windy Gulch		Barren			
Unnamed stream	Tourmaline Lake drainage	1998	Barren			
Unnamed stream	Lake Helene drainage		Barren			
Unnamed stream	Spruce/Loomis Lakes drainage, below 2928 m	1999	Barren			
Unnamed stream	Spruce/Loomis Lakes drainage, above 2928 m		GBC(A)			
Unnamed stream	Hourglass Lake drainage		Barren			
Unnamed stream	Rainbow/Irene Lakes drainage		Barren			
Unnamed stream	Lonesome Lake drainage		Barren			
Unnamed stream	Hayden Lake drainage		Barren			
Unnamed stream	Gorge Lakes drainage, below Arrowhead Lake	1999	CUT(B+)	197.86		
Unnamed stream	Gorge Lakes drainage, above Arrowhead Lake		Barren			
Unnamed stream	Forest Lake drainage		Unknown			
Unnamed stream	Doughnut Lake drainage		Barren			
Unnamed stream	Fork #13 Big Thompson River	1999	Barren			
Wind River	Below 2696 m	1986	BKT	94	10.67	
Wind River	Above 2696 m	1999	Barren			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Glacier Creek						
Andrews Creek			Unknown			
Andrews Tarn		1989	Barren			
Bear Lake		1986	GBC(A)	375.7		
Bierstadt Lake		1960	Barren			
Black Lake		1987	BKT	212.63	0.89	
Blue Lake		1978	Barren			
Boulder Brook	Below 2708 m	1998	BKT			
			BNT			
Boulder Brook	Above 2708 m	1986	Barren			
Chaos Creek	Glacier Creek to 2952 m		Unknown			
Chaos Creek	2952 m to Lake Haiyaha	1988	CUT	148		
Chaos Creek	Above Lake Haiyaha		Barren			
Dream Lake		1999	GBC(A)	354.5	5.55	
Embryo Lake		1964	Barren			
Emerald Lake		1978	Barren			
Frozen Lake		1963	Barren			
Glacier Creek	Below Prospect Canyon	1990	BKT	155	15.14	18.61
			BNT	150	9.62	39.48
			RBT	180	2.45	3.69
			CUT			
Glacier Creek	Prospect Canyon to Glacier Falls	1979	BKT	111.29		
			RBT	155		
Glacier Creek	Glacier Falls to 3074 m	1999	RBT			
			BKT			
			CUT			
Glacier Creek	3074 m to 3111 m	1999	CUT(B+)	198.68		
			BKT	224.9		
			RBT			
Glacier Creek	3111 m to Black Lake	1979	BKT	266.8		
Glacier Creek	Black Lake to Green Lake		Barren			
Glass Lake		1987	GBC(B)	274.4	0.46	
			BKT	370	0.05	
Green Lake		1978	Barren			
Haiyaha, Lake		1998	YCT(B)	338.16	1.01	
Icy Brook	Glacier Creek to 3013 m	1998	BKT			
			BNT			
Icy Brook	3013 m to Timberline Falls		GBC(B)			
Icy Brook	Timberline Falls to 3315 m		GBC(B)			
			BKT			
Icy Brook	3315 m to Sky Pond		BKT			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Glacier Creek (continued)						
Icy Brook	Above Sky Pond		Barren			
Jewel Lake		1979	RBT	164.28		
Loch, The		1997	GBC(B)	249.11	0.82	
Marigold Pond		1962	Barren			
Mill Creek	Below 2599 m	1999	BNT	173.5		
			RBT	186		
			BKT			
Mill Creek	2599 m to 2806 m	1999	BKT	180.72		
Mill Creek	Above 2806 m	1999	Barren			
Mills Lake		1995	RBT	263.46	1.3	
Nymph Lake		1961	Barren			
Round Pond		1964	Barren			
Shelf Creek		1988	Barren			
Shelf Lake		1988	Barren			
Sky Pond		1978	BKT	234.97	2.77	
Solitude Lake		1963	Barren			
Sprague Lake		1961	BKT		0.93	
			RBT	254.17	0.07	
			BNT			
Two Rivers Lake		1962	Barren			
Tyndall Creek	Below 2989 m		Unknown			
Tyndall Creek	2989 m to Dream Lake		GBC(A)			
Tyndall Creek	Above Dream lake	1988	Barren			
Unnamed stream	Bierstadt Lake drainage		Barren			
Unnamed stream	Bear Lake drainage, below 2879 m		Unknown			
Unnamed stream	Bear Lake drainage, above 2879 m		GBC(A)			
Unnamed stream	Fork of Andrews Creek, runs through The Gash		Unknown			
Unnamed stream	Blue Lake drainage		Barren			
Unnamed stream	Frozen Lake drainage		Barren			
Cache la Poudre River						
Cache la Poudre River		1999	BKT	203.95		
Cascade Creek	Below Mirror Lake	1981	BKT			
			BNT			
Cascade Creek	Above Mirror Lake		Barren			
Chapin Creek		1987	BKT	152.5	33	
Desolation Peaks Lake		1964	Barren			
Hague Creek	Cache la Poudre River to 3148 m	1999	BKT	158.37		

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Cache la Poudre River (continued)						
Hague Creek	3148 m to 3172 m	1999	CUT(A-)	287		
Hague Creek	Above 3172 m	1998	Barren			
Hazeline Lake		1990	Barren			
La Poudre Pass Creek	Below Long Draw Reservoir		Unknown			
La Poudre Pass Creek	Above Long Draw Reservoir	1988	CUT			
Mirror Lake		1991	BKT	220.78	9.33	
Mummy Pass Creek	Below 3306 m	1997	BKT	150.86	23.16	16.46
Mummy Pass Creek	Above 3306 m	1997	Barren			
Poudre Lake		1960	BKT			
Unnamed ditch	Runs from Specimen Creek to La Poudre Pass		Unknown			
Unnamed lake	Lowest above Hazeline Lake	1964	Barren			
Unnamed lake	2nd lowest above Hazeline Lake	1964	Barren			
Unnamed lake	3rd lowest above Hazeline Lake	1964	Barren			
Unnamed lake	Highest above Hazeline Lake	1964	Barren			
Unnamed lake	On fork #4 Hague Creek, lowest	1964	Barren			
Unnamed lake	On fork #4 Hague Creek, middle	1964	Barren			
Unnamed lake	On upper Hague Creek	1998	Barren			
Unnamed stream	Hazeline Lake drainage, below 3062 m	1999	BKT		13.2	
			CUT(B+)	192.63	1.6	
Unnamed stream	Hazeline Lake drainage, 3062 m to 3111 m	1999	CUT(B+)	204.67	5	
Unnamed stream	Hazeline Lake drainage, above 3111 m	1998	Barren			
Unnamed stream	Fork of Mummy Pass Creek, below 3294 m	1997	BKT			
Unnamed stream	Fork of Mummy Pass Creek, above 3294 m	1997	Barren			
Unnamed stream	Desolation Peaks Lake drainage		Barren			
Willow Creek	Below 3184 m	1999	BKT	152		
Willow Creek	Above 3184 m	1999	BKT	198.6	2.89	
			CUT(B+)	226	0.74	
Fall River						
Bighorn Creek		1986	Barren			
Caddis Lake		1999	GBC(A)	225.61	17.1	
Chipmunk Lake		1961	Barren			
Chiquita Creek		1984	Barren			
Chiquita Lake		1988	Barren			
Crystal Lake		1998	GBC(A)	398	1.15	
Fall River	Below point S of Sheep Lakes	1997	BNT	198.39	3.99	21.28
			LNS	242.33	1.99	24.86
			BKT	178	1.33	4.14

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Fall River (continued)						
Fall River	Point S of Sheep Lake to Fan Lake	1998	BKT	184.6	12.5	48.83
			BNT	218.7	6.71	50.84
			GBC			
			RBT			
Fall River	Fan Lake to Chasm Falls	1998	BKT	168.4	23.91	115.89
Fall River	Chasm Falls to 2879 m	1957	CUT			
			BKT			
			RBT			
Fall River	Above 2879 m	1998	Barren			
Fan Lake		1993	BKT	190.5	0.72	
			GBC	251	0.36	
Fay Lake		1988	Barren			
Faylene Lake		1961	Barren			
Hidden Valley Creek	Fall River to 2727 m		Unknown			
Hidden Valley Creek	2727 m to 2806 m	1998	BKT			
			GBC(A)	196.11		
			BNT			
Hidden Valley Creek	Above 2806 m	1998	Barren			
Iceberg Lake		1964	Barren			
Lawn Lake		1996	GBC(A)	280.44	13.73	
Little Crystal Lake		1982	Barren			
Roaring River	Fall River to Horseshoe Falls	1998	BKT	169.5	7.54	39.08
			GBC	163.09	1.74	9.96
			BNT	155	0.87	5.37
			RBT			
Roaring River	Horseshoe Falls to 2804 m	1991	GBC(A)	200.79	14.4	81.31
Roaring River	Above 2804 m	1989	GBC(A)	160.13	18.5	65.81
Sheep Lakes	N	1990	Barren			
Sheep Lakes	S	1990	Barren			
Spectacle Lakes	Lower	1961	Barren			
Spectacle Lakes	Upper	1961	Barren			
Sundance Creek	Below Thousand Falls	1984	BKT	187.66		
Sundance Creek	Above Thousand Falls	1984	Barren			
Unnamed lake	On Hidden Valley Creek, ABC Meadow	1998	BKT			
			GBC(A)			
Unnamed lake	On Hidden Valley Creek, boardwalk, lowest	1998	BKT			
			GBC(A)			
Unnamed lake	On Hidden Valley Creek, boardwalk, 2nd lowest	1998	BKT			
			GBC(A)			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Fall River (continued)						
Unnamed lake	On Hidden Valley Creek, boardwalk, 3rd lowest	1998	BKT			
			GBC(A)			
Unnamed lake	On Hidden Valley Creek, boardwalk, highest		BKT			
			GBC(A)			
Unnamed stream	W branch of Hidden Valley Creek, near Fall River jct	1998	Barren			
Unnamed stream	Fay Lakes drainage, below 3111 m		CRC(B+)			
Unnamed stream	Fay Lakes drainage, 3111 m to 3300 m	1999	GBC(A)	250.5		
Unnamed stream	Fay Lakes drainage, above 3300 m		Barren			
Unnamed stream	Spectacle Lakes drainage	1998	Barren			
Ypsilon Creek	Below 3172 m	1999	CRC(B+)	209.63		
Ypsilon Creek	3172 m to Ypsilon Lake		CRC(A-)			
Ypsilon Creek	Above Ypsilon Lake	1979	Barren			
Ypsilon Lake		1998	CRC(A-)	265 09	6 38	
North Fork Big Thompson River						
Cow Creek	Below Bridal Veil Falls	1999	BKT			
			BNT			
Cow Creek	Above Bridal Veil Falls		Unknown			
Dunraven, Lake		1969	Barren			
Fox Creek		1984	Barren			
Gem Lake		1964	Barren			
Grouse Creek		1984	Barren			
Husted, Lake		1998	GBC(A)	250.25	21.13	
Lost Lake		1998	GBC(A)	211.75	9.75	
Louise, Lake		1998	GBC(A)	265.14	9	
North Fork Big Thompson River	Below Lost Falls	1998	GBC(A)	278.16		
			BKT	176.17		
			BNT	123.63		
North Fork Big Thompson River	Lost Falls to 3367 m	1986	GBC(A)	226	1.58	
North Fork Big Thompson River	Above 3367 m	1958	Barren			
Rowe Glacier Lake		1970	Barren			
Unnamed lake	On NF Big Thompson River, below Lake Dunraven, upper	1984	GBC(A)	362.19	0.13	
Unnamed lake	On NF Big Thompson River, below Lake Dunraven, lower		GBC(A)			
Unnamed lake	On NF Big Thompson River, above Lake Dunraven, lower	1958	Barren			
Unnamed lake	On NF Big Thompson River, above Lake Dunraven, upper	1958	Barren			
Unnamed stream	Lost Lake drainage		GBC(A)			
Unnamed stream	Lake Louise drainage		GBC(A)			
West Creek	Below West Creek Falls	1999	BKT	177.53		
			GBC			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
North Fork Big Thompson River (continued)						
West Creek	West Creek Falls to 2720 m	1999	GBC(A)	179	3.67	17.31
West Creek	Above 2720 m		Barren			
North St. Vrain Creek						
Bluebird Lake		1979	Barren			
Box Lake		1980	BKT	211.33	1.86	
Campers Creek		1985	Barren			
Castle Lake		1964	Barren			
Castle Lakes	S of Castle Lake, W		Unknown			
Castle Lakes	S of Castle Lake, E		Unknown			
Chickadee Pond		1964	Barren			
Cony Creek	North St Vrain Creek to Calypso Cascades		Unknown			
Cony Creek	Calypso Cascades to Upper Hutcheson Lake	1989	GBC(A)			
Cony Creek	Above Upper Hutcheson Lake	1998	Barren			
Cony Lake		1998	Barren			
Copeland Lake		1992	RBT			
			BKT			
Eagle Lake		1980	Barren			
Falcon Lake		1964	Barren			
Finch Lake		1981	Barren			
Fox Creek		1985	Barren			
Frigid Lake		1964	Barren			
Horse Creek		1985	Barren			
Hunters Creek	North St Vrain Creek to 2623 m		Unknown			
Hunters Creek	2623 m to Lyric Falls	1999	GBC(A)	195.27	11.22	
Hunters Creek	Lyric Falls to Keplinger Lake		Barren			
Hutcheson Lakes	Lower	1998	GBC(A)	298.3	13.33	
Hutcheson Lakes	Middle	1998	GBC(A)	338.14	11.66	
Hutcheson Lakes	Upper	1998	GBC(A)	265.42	15	
Indigo Pond		1964	Barren			
Isolation Lake			Unknown			
Junco Lake		1964	Barren			
Keplinger Lake		1963	Barren			
Lake of Many Winds		1964	Barren			
Lark Pond		1963	Barren			
Lion Lake No. 1		1999	Barren			
Lion Lake No. 2		1980	Barren			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
North St. Vrain Creek (continued)						
North St Vrain Creek	Below Copeland Falls	1997	BNT	239.72	16.92	47.82
			BKT			
			CUT			
North St Vrain Creek	Copeland Falls to Falcon Lake	1998	CUT			
			BKT			
			BNT			
Ouzel Creek	North St Vrain Creek to Ouzel Falls		Unknown			
Ouzel Creek	Ouzel Falls to 2989 m	1998	BKT	193.32	44.71	176.84
			GBC(A)	210.25	4.33	23.63
Ouzel Creek	2989 m to 3087 m	1998	BKT	203.59	27.45	136.34
			GBC(A)	215.13	22.22	126.53
Ouzel Creek	3087 m to 3233 m	1984	GBC(A)	140.27		
Ouzel Creek	Above 3233 m		Barren			
Ouzel Lake		1998	GBC(A)	268.33	51.21	
			BKT	303.57	17.07	
Pear Creek			GBC(A)			
Pear Lake		1998	GBC(A)	237	7.4	
Pipit Lake		1961	Barren			
Sandbeach Creek	North St Vrain Creek to 2660 m		Unknown			
Sandbeach Creek	2660 m to 2745 m	1999	GBC(B+)	188.33		
Sandbeach Creek	2745 m to 3135 m	1999	GBC(A-)	180.86		
Sandbeach Creek	3135 m to Sandbeach Lake	1998	GBC(A)			
Sandbeach Lake		1998	GBC(A)	327.33	1.5	
Snowbank Lake		1980	Barren			
Thunder Lake		1998	CUT(B)	313.68	4.76	
			BKT	346	0.25	
Twin Lakes	E, aka Radcliff Ponds	1980	Barren			
Twin Lakes	W, aka Radcliff Ponds	1980	Barren			
Unnamed stream	Junco Lake drainage		Barren			
Unnamed stream	Lion Lakes drainage, below Thunder Falls	1999	BKT	182.57		
Unnamed stream	Lion Lakes drainage, above Thunder Falls	1999	Barren			
Unnamed stream	Eagle Lake drainage, below Martensia Falls		Unknown			
Unnamed stream	Eagle Lake drainage, Martensia Falls to 3233 m		BKT			
Unnamed stream	Eagle Lake drainage, above 3233 m		Barren			
Unnamed stream	Box Lake drainage		BKT			
Unnamed stream	Indigo Pond drainage		Barren			
Unnamed stream	Lake of Many Winds drainage	1998	Barren			
Unnamed stream	Fork #11 North St Vrain Creek, below Fan Falls		Unknown			
Unnamed stream	Finch Lake drainage	1988	Barren			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Roaring Fork/Cabin Creek						
Alpine Brook		1985	Barren			
Cabin Creek	Below 2867 m	1985	BKT	208.5	5.33	119.73
Cabin Creek	Above 2867 m		Unknown			
Chasm Lake		1985	Barren			
Inn Brook		1985	Barren			
Larkspur Creek		1985	Barren			
Peacock Pool		1972	BKT	188.51	1.65	
Roaring Fork	Below 3453 m	1985	BKT			
Roaring Fork	Above 3453 m		Barren			
South Fork Cache la Poudre River						
South Fork Cache la Poudre River	Below 2879 m	1999	GBC(A)	254.33		
South Fork Cache la Poudre River	Above 2879 m		Barren			
WEST SIDE DRAINAGES						
Colorado River, Lower						
Colorado River	Below Shadow Mountain Dam	1989	BKT			
			BNT			
			LNS			
			SCU			
Columbine Creek	Colorado River to 2733 m		BKT			
Columbine Creek	2733 m to 2794 m	1998	CRC(A-)	184.45		
Columbine Creek	Above 2794 m	1998	Barren			
Pole Creek		1987	Barren			
Ranger Creek		1987	Barren			
Colorado River, Upper						
Baker Creek		1999	BKT			
			BNT			
Beaver Creek		1972	BKT			
Bennett Creek		1987	Barren			
Big Dutch Creek		1975	Barren			
Bighorn Lake		1962	Barren			
Chickaree Lake		1964	Barren			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Colorado River, Upper (continued)						
Colorado River	Park boundary to gaging station at 2672 m	1997	BNT	165.5		
			BKT	172		
			LNS	120		
			RBT			
			WS			
			SCU			
Colorado River	Gaging station at 2672 m to 2806 m	1997	BKT	177.93		
			BNT	241.48		
			SCU			
Colorado River	Above 2806 m	1999	BKT	149.8	17.57	57.89
			CRC(A)	140	0.54	0.7
Grand Ditch		1988	CUT			
			BNT			
Green Valley Stream		1988	Barren			
Irene, Lake		1968	Barren			
Julian Lake		1988	Barren			
Lady Creek		1988	Barren			
Lake of the Clouds		1986	Barren			
Little Dutch Creek		1988	Barren			
Lost Creek		1988	Barren			
Lulu Creek		1975	Barren			
Middle Dutch Creek			Unknown			
Mosquito Creek		1975	Barren			
Onahu Creek	Colorado River to 2745 m	1998	BKT	151.8	48 76	166 88
			BNT	121.5	1	1.45
			SCU			
Onahu Creek	2745 m to 3196 m	1987	BKT			
Onahu Creek	3196 m to 3294 m	1999	CRC(A-)	233.14		
Onahu Creek	3294 m to Julian Lake	1999	CRC(A-)	258		
Opposition Creek		1975	Barren			
Phantom Creek		1986	Barren			
Pinnacle Pool		1964	Barren			
Sawmill Creek		1999	Barren			
Specimen Creek		1987	Barren			
Squeak Creek		1986	Barren			
Timber Creek	Below 2867 m	1997	BKT	176.63		
Timber Creek	Above 2867 m	1986	CRC(A)	102.12		
Timber Lake		1998	CRC(A)	359.68	3.98	
Unnamed lake	On Beaver Creek, near Colorado River jct., highest	1972	BKT			
Unnamed lake	On Big Dutch Creek, below Lake of the Clouds	1986	Barren			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
Colorado River, Upper (continued)						
Unnamed stream	Fork #4 Onahu Creek, through Long Meadows		Unknown			
Unnamed stream	Runs out of Bowen Gulch		BKT			
			BNT			
			LNS			
			SCU			
			WS			
			RBT			
Unnamed stream	runs through Red Gulch, below 2782 m	1988	BKT			
Unnamed stream	runs through Red Gulch, above 2782 m		Unknown			
Unnamed stream	runs through Crater Gulch	1986	Barren			
East Inlet						
Adams Lake		1981	CRC(A)	305.12	0.29	
Boundary Lake		1990	CRC(A)	300.52	34	
East Inlet	Below Adams Falls	1995	BNT	376		
			BKT	150		
East Inlet	Adams Falls to falls at 2745 m	1999	BKT	156.58		
East Inlet	Falls at 2745 m to 3294 m		BKT			
East Inlet	3294 m to Fifth Lake		CRC(A-)			
East Inlet	Above Fifth Lake		Barren			
Echo Creek	Below 2928 m	1987	BKT	175.8		
Echo Creek	Above 2928 m	1987	Barren			
Fifth Lake		1998	CRC(A-)	278.5	0.64	
Fourth Lake		1992	BKT	216.31	4.94	
Lone Pine Lake		1973	BKT	199.3	3.83	
Paradise Creek	East Inlet to 2904 m		Unknown			
Paradise Creek	2904 m to 3026 m	1998	CRC(A-)	206.86		
Paradise Creek	3026 m to 3172 m, through Paradise Park	1999	CRC(B)	239.23		
Paradise Creek	3172 m to Boundary Lake	1999	CRC(B+)			
Spirit Lake		1992	BKT	224.63	3.68	
			CRC(A)	292	0.07	
Ten Lake Park Lake		1987	CRC(C)	335.35	1.09	
Unnamed lake	On fork #4 Paradise Creek, lowest	1981	Barren			
Unnamed lake	On fork #4 Paradise Creek, 2nd lowest	1981	Barren			
Unnamed lake	On fork #4 Paradise Creek, 3rd lowest	1981	Barren			
Unnamed lake	On fork #4 Paradise Creek, highest	1981	Barren			
Unnamed lake	On Paradise Creek, between forks #4 and #5	1999	CRC(B+)	320	4.06	
Unnamed pond	NE of Mt. Adams, large	1981	Barren			
Unnamed stream	Adams Lake drainage	1981	CRC(A)			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
East Inlet (continued)						
Verna, Lake		1973	BKT	216.55	3	
North Inlet						
Bench Lake		1999	CRC(A)	263.87		
Hallett Creek		1991	Barren			
Nanita, Lake		1980	CRC(A)	268	1.5	
Nokoni, Lake		1987	Barren			
North Inlet	Below Cascade Falls	1995	BNT	235.75		
			BKT	156.13		
			SCU			
North Inlet	Cascade Falls to falls at 2891 m	1992	CRC(B)	217		
			BKT			
North Inlet	Falls at 2891 m to 3026 m	1999	CRC(B)	217.12		
North Inlet	3026 m to Lake Powell	1987	Barren			
Pettingell Lake		1999	CUT(B+)	283.06	15	
Powell, Lake		1987	Barren			
Ptarmigan Creek	North Inlet to War Dance Falls		Unknown			
Ptarmigan Creek	War Dance Falls to 3172 m	1999	CRC(A)	230.33		
Ptarmigan Creek	Above 3172 m		Barren			
Ptarmigan Lake		1984	Barren			
Snowdrift Lake		1984	Barren			
Solitude, Lake		1999	CRC(B)	266.25	3.07	
Unnamed lake	Source of fork #4 of Ptarmigan Creek	1984	Barren			
Unnamed lake	On Ptarmigan Creek, below Ptarmigan Lake	1984	Barren			
Unnamed lake	On fork #15 North Inlet, upper, larger	1987	Barren			
Unnamed lake	On fork #15 North Inlet, lower, smaller	1987	Barren			
Unnamed lake	On North Inlet, below fork #16	1987	Barren			
Unnamed lake	On North Inlet, below Lake Powell	1987	Barren			
Unnamed stream	Pettingell Lake drainage	1999	Barren			
Unnamed stream	Snowdrift Lake drainage, below 3172 m		CRC(A)			
Unnamed stream	Snowdrift Lake drainage, above 3172 m		Barren			
Unnamed stream	Fork #4 Ptarmigan Creek, below 3172 m		CRC(A)			
Unnamed stream	Fork #4 Ptarmigan Creek, above 3172 m		Barren			
Unnamed stream	Lake Nokoni drainage		Unknown			
Unnamed stream	Lake Nanita drainage, below 3282 m		Unknown			
Unnamed stream	Lake Nanita drainage, 3282 m to Lake Nanita		CRC(A)			
Unnamed stream	Lake Nanita drainage, above Lake Nanita		Barren			

TABLE 2. CONTINUED

Water	Location	Year of Last Survey	Species	Average Length (mm)	Fish per 100'/Net Hour	Kg/Ha (Streams Only)
North Inlet (continued)						
Unnamed stream	Fork #15 North Inlet	1987	Barren			
Tonahutu Creek						
Harbison Ditch			Unknown			
Haynach Lakes	Lake on fork #7 Tonahutu Creek, upper, larger	1999	YCT(B)	286.5	8.27	
Haynach Lakes	Lake on fork #7 Tonahutu Creek, lower , smaller	1999	YCT(B)	202.2		
Haynach Lakes	2 of 6 ponds	1999	Barren			
Haynach Lakes	3 of 6 ponds	1999	Barren			
Haynach Lakes	1 of 6 ponds		Unknown			
Haynach Lakes	5 of 6 ponds	1999	YCT(B)			
Haynach Lakes	6 of 6 ponds	1999	Barren			
Haynach Lakes	4 of 6 ponds	1999	Barren			
Murphy Lake		1986	Barren			
Tonahutu Creek	Below 2733 m	1995	BKT	192.47		
			BNT	212.8		
			CRC	180		
Tonahutu Creek	2733 m to Granite Falls	1988	BKT	149	6.33	26.09
			CRC			
Tonahutu Creek	Granite Falls to 3099 m	1957	CRC			
Tonahutu Creek	Above 3099 m	1999	Barren			
Unnamed lake	On Tonahutu Creek, near headwaters	1999	Barren			
Unnamed stream	Murphy Lake drainage	1999	Barren			
Unnamed stream	Haynach Lakes drainage	1999	YCT(B)	230.77		
Unnamed stream	Fork #8 Tonahutu Creek	1999	Barren			
Unnamed stream	Fork #9 Tonahutu Creek	1999	Barren			

TABLE 3. RMNP GREENBACK CUTTHROAT TROUT WATERS BY PURITY, ELEVATION, BIOLOGICAL STATUS AND HECTARES/KILOMETERS, 2000

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
West Creek	West Creek Falls to 2720 m	GBC (A)	2622.99 *	2*	3.05
Lily Lake		GBC (A)	2722.73	7	6.8
Hidden Valley Creek	2727 m to 2806 m	GBC (A) ,BKT	2766.34	1	2.89
Roaring River	Horseshoe Falls to 2804 m	GBC (A)	2798.37 *	1	2.09
Fern Creek	Fern Falls to 3056 m	GBC (A)	2805.99 *	1	2.25
South Fork Cache la Poudre River	Below 2879 m	GBC (A)	2876.15	8	0.16
Bear Lake		GBC (A)	2889.87	2	4.47
Fern Lake		GBC (A)	2897.49	1	3.67
Roaring River	Above 2804 m	GBC (A)	2927.99 *	1	5.79
Spruce Lake		GBC (A)	2940.19	1	1.48
Ouzel Creek	Ouzel Falls to 2989 m	GBC (A) ,BKT	2952.4 *	1	1.44
Hunters Creek	2623 m to Lyric Falls	GBC (A)	2972.22 *	8	2.89
Dream Lake		GBC (A)	3022.54	6	2.2
Odessa Lake		GBC (A)	3049.99	1	4.47
Ouzel Creek	2989 m to 3087 m	GBC (A) ,BKT	3062.19 *	1	1.12
Ouzel Lake		GBC (A) ,BKT	3080.49	1	2.56
Primrose Lake		GBC (A)	3089.65	1	0.36
Cony Creek	Calypso Cascades to Upper Hutcheson Lake	GBC (A)	3110.99 *	1	5.79
Loomis Lake		GBC (A)	3123.19	7	1.11
Sandbeach Lake		GBC (A)	3141.49	1	6.6
Ouzel Creek	3087 m to 3233 m	GBC (A)	3159.79	1	0.96
Pear Lake		GBC (A)	3226.9	1	6.6
Lost Lake		GBC (A)	3275.69	1	3.67
Caddis Lake		GBC (A)	3278.74	1	0.28
North Fork Big Thompson River	Lost Falls to 3367 m	GBC (A) , BKT	3293.99 *	1	4.67
Lower Hutcheson Lake		GBC (A)	3309.86	1	1.71
Lawn Lake		GBC (A)	3354.99	1	7.99
Husted, Lake		GBC (A)	3367.19	7	4.04
Louise, Lake		GBC (A)	3367.19	7	2.56
Middle Hutcheson Lake		GBC (A)	3373.29	1	0.99
Upper Hutcheson Lake		GBC (A)	3415.99	1	2.96
Crystal Lake		GBC (A)	3513.59	7	9.92
Sandbeach Creek	2745 m to 3135 m	GBC (A-)	2940.2	1	0.64
Big Thompson River	2574 m to 3242 m, through Forest Canyon	GBC (A-)	3025.59 *	1	12.56
Arrowhead Lake		GBC (A-)	3399.53	1*	13.96

TABLE 3. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Sandbeach Creek	2660 m to 2745 m	GBC (B+)	2702.3	3	2.57
Loch, The		GBC (B)	3110.99	3	5.87
Glass Lake		GBC (B) ,BKT	3300.09	3	1.83

TABLE 4. RMNP COLORADO RIVER CUTTHROAT TROUT WATERS BY PURITY, ELEVATION, BIOLOGICAL STATUS AND HECTARES/KILOMETERS, 2000

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Colorado River	Above 2806 m	CRC (A) ,BKT	2848.69 *	4^	5.63
Ptarmigan Creek	War Dance Falls to 3172 m	CRC (A)	3080.49	8	1.93
Bench Lake		CRC (A)	3095.74	8	2.56
Timber Creek	Above 2867 m	CRC (A)	3281.79 *	1	4.18
Nanita, Lake		CRC (A)	3290.94	1	13.6
Boundary Lake		CRC (A)	3318.4	1	0.72
Timber Lake		CRC (A)	3373.29	1	4.04
Adams Lake		CRC (A)	3419.04	1	1.83
Columbine Creek	2733 m to 2794 m	CRC (A-)	2781.59 *	2	1.12
Paradise Creek	2904 m to 3026 m	CRC (A-)	2921.9 *	1^	1.93
Ypsilon Lake		CRC (A-)	3214.69	3	2.96
Onahu Creek	3196 m to 3294 m	CRC (A-)	3245.19	1	1.12
Fifth Lake		CRC (A-)	3312.29	1	2.96
Onahu Creek	3294 m to Julian Lake	CRC (A-)	3332.12	1*	0.64
Ypsilon Creek	Below 3172 m	CRC (B+)	3050	3	
Paradise Creek	3172 m to Boundary Lake	CRC (B+)	3242.15	3	2.41
North Inlet	Cascade Falls to falls at 2891 m	CRC (B) ,BKT	2787.69	3	6.44
North Inlet	Falls at 2891 m to 3026 m	CRC (B)	2952.4 *	3	3.7
Solitude, Lake		CRC (B)	2964.59	3	2.96
Paradise Creek	3026 m to 3172 m, through Paradise Park	CRC (B)	3098.79	3	3.7
Ten Lakes Park Lake		CRC (C)	3415.99	3	4.87

TABLE 5. RMNP CUTTHROAT TROUT WATERS BY SUBSPECIES, ELEVATION, BIOLOGICAL STATUS AND HECTARES/KILOMETERS, 2000

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Big Thompson River	Bear Lake Road to 2477 m, through Moraine Park	GBC, BNT, BKT, RBT, WS, LNS	2443.04 *	4	4.67
Big Thompson River	2477 m to 2574 m	GBC, BKT, BNT, RBT	2479.65 *	4	3.22
North St Vrain Creek	Below Copeland Falls	CUT, BNT, BKT	2531.49 *	4	2.41
Pool, The		GBC, BKT, BNT, RBT	2531.49	4	
Roaring River	Fall River to Horseshoe Falls	GBC, BKT, BNT, RBT	2546.74 *	4	0.48
Fall River	Point S of Sheep Lake to Fan Lake	GBC, BKT, BNT, RBT	2592.49 *	4	1.61
Fan Lake		GBC, BKT	2607.74	4	
Glacier Creek	Below Prospect Canyon	CUT, BKT, BNT. RBT	2616.9 *	4	7.4
West Creek	West Creek Falls to 2720 m	GBC(A)	2622.99 *	2*	3.05
Sandbeach Creek	2660 m to 2745 m	GBC(B+)	2702.3	3	0.64
Tonahutu Creek	Below 2733 m	CUT, BKT, BNT	2622.99 *	4	1.77
Lily Lake		GBC(A)	2722.73	7	6.8
Fall River	Chasm Falls to 2879 m	CUT, BKT, RBT	2758.72 *	4	1.93
Hidden Valley Creek	2727 m to 2806 m	GBC(A), BKT, BNT	2766.34	1	2.89
Columbine Creek	2733 m to 2794 m	CRC(A-)	2781.59 *	2	1.12
North Inlet	Cascade Falls to falls at 2891 m	CRC(B), BKT	2787.69	3	6.44
Roaring River	Horseshoe Falls to 2804 m	GBC(A)	2798.37 *	1	2.09
Fern Creek	Fern Falls to 3056 m	GBC(A)	2805.99 *	1	2.25
Colorado River	Above 2806 m	CRC(A), BKT	2848.69 *	4^	5.63
South Fork Cache la Poudre River	Below 2879 m	GBC(A)	2876.15	8	0.16
Tonahutu Creek	2733 m to Granite Falls	CUT, BKT	2879.19 *	4	6.28
Bear Lake		GBC(A)	2889.87	2	4.47
Fern Lake		GBC(A)	2897.49	1	3.67
Paradise Creek	2904 m to 3026 m	CRC(A-)	2921.9 *	1^	1.93
Roaring River	Above 2804 m	GBC(A)	2927.99 *	1	5.79
Sandbeach Creek	2745 m to 3135 m	GBC(A-)	2940.19	1	2.57
Spruce Lake		GBC(A)	2940.19	1	1.48
Ouzel Creek	Ouzel Falls to 2989 m	GBC(A), BKT	2952.4 *	1	1.44
North Inlet	Falls at 2891 m to 3026 m	CRC(B)	2952.4 *	3	2.81
Solitude, Lake		CRC(B)	2964.59	3	3.7
Hunters Creek	2623 m to Lyric Falls	GBC(A)	2972.22 *	8	2.89
North St Vrain Creek	Copeland Falls to Falcon Lake	CUT, BKT, BNT	2982.9	4	9.01
Dream Lake		GBC(A)	3022.54	6	2.2
Big Thompson River	2574 m to 3242 m, through Forest Canyon	GBC(A-)	3025.59 *	1	12.56
Tonahutu Creek	Granite Falls to 3099 m	CUT	3043.9	3	2.25
Odessa Lake		GBC(A)	3049.99	1	4.47
Ypsilon Creek	Below 3172 m	CRC(B+)	3049.99 *	3	2.41
Unnamed stream	Hazeline Lake drainage, below 3062 m	CUT(B+), BKT	3053.04	4	0.16
Ouzel Creek	2989 m to 3087 m	GBC(A), BKT	3062.19 *	1	1.12

TABLE 5. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Ouzel Lake		GBC(A), BKT	3080.49	1	2.56
Ptarmigan Creek	War Dance Falls to 3172 m	CRC(A)	3080.49	8	1.93
Unnamed stream	Hazeline Lake drainage, 3062 m to 3111 m	CUT(B+), BKT	3086.59	3	0.16
Primrose Lake		GBC(A)	3089.65	7	0.36
La Poudre Pass Creek	Above Long Draw Reservoir	CUT	3092.69	3	2.25
Glacier Creek	3074 m to 3111 m	CUT(B+), BKT, RBT	3092.69	3	0.32
Bench Lake		CRC(A)	3095.74	8	2.56
Icy Brook	3013 m to Timberline Falls	GBC(B)	3098.79	3	1.28
Paradise Creek	3026 m to 3172 m, through Paradise Park	CRC(B)	3098.79	3	3.7
Unnamed stream	Fay Lakes drainage, below 3111 m	CRC(B+)	3100.32	3	0.32
Loch, The		GBC(B)	3110.99	3	5.87
Cony Creek	Calypso Cascades to Upper Hutcheson Lake	GBC(A)	3110.99 *	1	5.79
Haiyaha, Lake		YCT(B)	3117.09	4	6.24
Loomis Lake		GBC(A)	3123.19	7	1.11
Little Rock Lake		CUT(B+)	3135.4	3	0.28
Rock Lake		CUT(B+)	3141.49	3	2.2
Sandbeach Lake		GBC(A)	3141.49	1	6.6
Grand Ditch		CUT, BNT	3158.57	6	23.35
Hague Creek	3148 m to 3172 m	CUT(A-)	3159.79	3^	0.8
Ouzel Creek	3087 m to 3233 m	GBC(A)	3159.79	1	0.96
Unnamed stream	Gorge Lakes drainage, below Arrowhead Lake	CUT(B+)	3204.02	3	2.57
Pettingell Lake		CUT(B+)	3205.54	3	4.04
Willow Creek	Above 3184 m	CUT(B+), BKT	3205.54 *	3	3.22
Unnamed stream	Fay Lakes drainage, 3111 m to 3300 m	GBC(A)	3205.54	1	1.28
Ypsilon Lake		CRC(A-)	3214.69	3	2.96
Thunder Lake		CUT(B), BKT	3225.06	3	6.6
Pear Lake		GBC(A)	3226.9	1	6.6
Unnamed stream	Haynach Lakes drainage	YCT(B)	3235.44	4	2.41
Paradise Creek	3172 m to Boundary Lake	CRC(B+)	3242.15	3	2.41
Onahu Creek	3196 m to 3294 m	CRC(A-)	3245.19	1	1.12
Icy Brook	Timberline Falls to 3315 m	GBC(B), BKT	3249.77	3	0.48
Lost Lake		GBC(A)	3275.69	1	3.67
Caddis Lake		GBC(A)	3278.74	1	0.28
Timber Creek	Above 2867 m	CRC(A)	3281.79 *	1	4.18
Nanita, Lake		CRC(A)	3290.94	1	13.6
North Fork Big Thompson River	Lost Falls to 3367 m	GBC(A), BKT	3293.99 *	1	4.67
Glass Lake		GBC(B), BKT	3300.09	3	1.83
Lower Hutcheson Lake		GBC(A)	3309.86	1	1.71
Fifth Lake		CRC(A-)	3312.29	1	2.96
Boundary Lake		CRC(A)	3318.4	1	0.72

TABLE 5. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Onahu Creek	3294 m to Julian Lake	CRC(A-)	3332.12	1*	0.64
Lawn Lake		GBC(A)	3354.99	1	7.99
Haynach Lakes	Lower , smaller	YCT(B)	3364.15	4	
Husted, Lake		GBC(A)	3367.19	7	4.04
Louise, Lake		GBC(A)	3367.19	7	2.56
Middle Hutcheson Lake		GBC(A)	3373.29	1	0.99
Timber Lake		CRC(A)	3373.29	1	4.04
Haynach Lakes	Upper, larger	YCT(B)	3379.4	4	2.56
Arrowhead Lake		GBC(A-)	3399.52	1*	13.96
Upper Hutcheson Lake		GBC(A)	3415.99	1	2.96
Ten Lakes Park Lake		CRC(C)	3415.99	3	4.87
Adams Lake		CRC(A)	3419.04	1	1.83
Crystal Lake		GBC(A)	3513.59	7	9.92

TABLE 6. RMNP BROOK TROUT WATERS BY ELEVATION, BIOLOGICAL STATUS AND HECTARES/KILOMETERS, 2000

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Big Thompson River	Below Bear Lake Road	BKT	2403.4	4	0.64
Big Thompson River	Bear Lake Road to 2477 m, through Moraine Park	BKT, BNT, RBT, LNS	2443.04 *	4	4.67
West Creek	Below West Creek Falls	BKT, GBC	2468.97	4	0.48
Black Canyon Creek	Below 2538 m	BKT	2473.54	4	2.09
Big Thompson River	2477 m to 2574 m	BKT, BNT, RBT,GBC	2479.65 *	4	3.22
Mill Creek	Below 2599 m	BKT, BNT, RBT	2488.79 *	4	2.41
North St Vrain Creek	Below Copeland Falls	BKT, BNT, CUT	2531.49 *	4	2.41
Pool, The		BKT, BNT, RBT, GBC	2531.49	4	
Copeland Lake		BKT, RBT	2537.9	6	
Colorado River	Below Shadow Mountain Dam	BKT, BNT, LNS, SCU	2539.12	4	2.25
Roaring River	Fall River to Horseshoe Falls	BKT, GBC, BNT, RBT	2546.74 *	4	0.48
Cow Creek	Below Bridal Veil Falls	BKT, BNT	2574.19	4	3.86
Fall River	Below point S of Sheep Lakes	BKT, BNT, LNS	2577.24 *	4	3.22
East Inlet	Below Adams Falls	BKT, BNT	2583.34	4	0.16
Fall River	Point S of Sheep Lake to Fan Lake	BKT, BNT, GBC, RBT	2592.49 *	4	1.61
North Inlet	Below Cascade Falls	BKT, BNT, SCU	2592.49 *	4	4.02
Columbine Creek	Colorado River to 2733 m	BKT	2601.65	4	2.09
Fan Lake		BKT, GBC	2607.74	4	
Glacier Creek	Below Prospect Canyon	BKT, BNT, RBT, CUT	2616.9 *	4	7.4
Mill Creek	2599 m to 2806 m	BKT	2622.99 *	4	2.41
Echo Creek	Below 2928 m	BKT	2622.99 *	4	1.77
Tonahutu Creek	Below 2733 m	BKT, BNT, CUT	2622.99 *	4	1.77
Colorado River	Park boundary to gaging station at 2672 m	BKT, BNT, LNS, RBT, WS, SCU	2641.29 *	4	10.46
Sprague Lake		BKT, RBT, BNT	2647.4	4	5.16
Fall River	Fan Lake to Chasm Falls	BKT	2647.4 *	4	3.54
Wind River	Below 2696 m	BKT	2659.59 *	4	1.93
East Inlet	Adams Falls to falls at 2745 m	BKT	2664.17	4	4.18
Onahu Creek	Colorado River to 2745 m	BKT, BNT, SCU	2668.74 *	4	4.18
Baker Creek		BKT, BNT	2680.94	4	4.02
Sundance Creek	Below Thousand Falls	BKT	2683.99	4	0.32
Unnamed stream	Runs out of Bowen Gulch	BKT, BNT, LNS, SCU, WS, RBT	2683.99	4	0.8
Colorado River	Gaging station at 2672 m to 2806 m	BKT, BNT, SCU	2708.4 *	4	14.09
Cabin Creek	Below 2867 m	BKT	2714.49 *	4	1.93
Timber Creek	Below 2867 m	BKT	2720.59 *	4	0.96
Boulder Brook	Below 2708 m	BKT, BNT	2720.59	4	1.61
Unnamed stream	Runs through Red Gulch, below 2782 m	BKT	2754.15	4	0.4
Fall River	Chasm Falls to 2879 m	BKT, CUT, RBT	2758.72 *	4	1.93
Hidden Valley Creek	2727 m to 2806 m	BKT, GBC(A), BNT	2766.34	1	2.89
Spruce Creek	2769 m to 2781 m	BKT	2775.49	4	0.16

TABLE 6. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
North Inlet	Cascade Falls to falls at 2891 m	BKT, CRC(B)	2787.69	3	6.44
North Fork Big Thompson River	Below Lost Falls	BKT, GBC(A), BNT	2859.37	4	4.83
Tonahutu Creek	2733 m to Granite Falls	BKT, CUT	2879.19 *	4	6.28
Colorado River	Above 2806 m	BKT, CRC(A)	2927.99 *	4^	5.63
Ouzel Creek	Ouzel Falls to 2989 m	BKT, GBC(A)	2952.4 *	1	1.44
Glacier Creek	Prospect Canyon to Glacier Falls	BKT, RBT	2966.12 *	4	2.25
Onahu Creek	2745 m to 3196 m	BKT	2970.69	4	5.23
Roaring Fork	Below 3453 m	BKT	2978.32	4	7.56
North St Vrain Creek	Copeland Falls to Falcon Lake	BKT, CUT, BNT	2982.9	4	9.01
Icy Brook	Glacier Creek to 3013 m	BKT, BNT	2992.04	4	0.48
Lone Pine Lake		BKT	3014.92	4	5.16
East Inlet	Falls at 2745 m to 3294 m	BKT	3019.49	4	5.79
Beaver Creek		BKT	3037.79	4	5.47
Glacier Creek	Glacier Falls to 3074 m	BKT, RBT, CUT	3043.28	4	1.12
Unnamed stream	Hazeline Lake drainage, below 3062 m	BKT, CUT(B+)	3053.04	4	0.16
Ouzel Creek	2989 m to 3087 m	BKT, GBC(A)	3062.19 *	1	1.12
Hague Creek	Cache la Poudre River to 3148 m	BKT	3065.24	4	5.79
Ouzel Lake		BKT, GBC(A)	3080.49	1	2.56
Cache la Poudre River		BKT	3080.49 *	4	16.1
Glacier Creek	3074 m to 3111 m	BKT, CUT(B+), RBT	3092.69	3	0.32
Willow Creek	Below 3184 m	BKT	3098.79	4	4.99
Verna, Lake		BKT	3110.99	4	13.24
Spirit Lake		BKT	3138.44	4	7.35
Cascade Creek	Below Mirror Lake	BKT, BNT	3143.02	4	6.44
Fourth Lake		BKT	3168.94	4	2.96
Chapin Creek		BKT	3171.99 *	4	4.83
Glacier Creek	3111 m to Black Lake	BKT	3171.99	4	1.12
Mummy Pass Creek	Below 3306 m	BKT	3200.97	4	1.93
Unnamed stream	Eagle Lake drainage, Martensia Falls to 3233 m	BKT	3202.49	4	0.48
Willow Creek	Above 3184 m	BKT, CUT(B+)	3205.54 *	3	3.22
--BKT will be removed from a 900-1,100 m section yearly from 1998 through 2002 as part of a study, see Special Studies and Reports section					
Thunder Lake		BKT, CUT(B)	3225.06	3	6.6
Black Lake		BKT	3232.99	4	3.67
Unnamed stream	Box Lake drainage	BKT	3240.62	4	0.64
Unnamed stream	Lion Lakes drainage, below Thunder Falls	BKT	3246.72	4	1.12
Icy Brook	Timberline Falls to 3315 m	BKT, GBC(B)	3249.77	3	0.48
Box Lake		BKT	3281.79	4	2.56
Poudre Lake		BKT	3281.79	4	5.52
North Fork Big Thompson River	Lost Falls to 3367 m	BKT, GBC(A)	3293.99 *	1	4.67

TABLE 6. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Glass Lake		BKT, GBC(B)	3300.09	3	1.83
Sky Pond		BKT	3318.4	4	4.47
Mirror Lake		BKT, BNT	3361.09	4	8.4
Peacock Pool		BKT	3434.29	4	1.83

TABLE 7. RMNP BROWN TROUT WATERS BY ELEVATION, BIOLOGICAL STATUS AND HECTARES/KILOMETERS, 2000

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Big Thompson River	Bear Lake Road to 2477 m, through Moraine Park	BNT, BKT, RBT, LNS	2443.04 *	4	4.67
Big Thompson River	2477 m to 2574 m	BNT, BKT, RBT, GBC	2479.65 *	4	3.22
Mill Creek	Below 2599 m	BNT, RBT, BKT	2488.79 *	4	2.41
North St Vrain Creek	Below Copeland Falls	BNT, BKT, CUT	2531.49 *	4	2.41
Pool, The		BNT, BKT, RBT, GBC	2531.49	4	
Colorado River	Below Shadow Mountain Dam	BNT, BKT, LNS, SCU	2539.12	4	2.25
Roaring River	Fall River to Horseshoe Falls	BNT, GBC, BKT, RBT	2546.74 *	4	0.48
Cow Creek	Below Bridal Veil Falls	BNT, BKT	2574.19	4	3.86
Fall River	Below point S of Sheep Lakes	BNT, BKT, LNS	2577.24 *	4	3.22
East Inlet	Below Adams Falls	BNT, BKT	2583.34	4	0.16
Fall River	Point S of Sheep Lake to Fan Lake	BNT, BKT, GBC, RBT	2592.49 *	4	1.61
North Inlet	Below Cascade Falls	BNT, BKT, SCU	2592.49 *	4	4.02
Glacier Creek	Below Prospect Canyon	BNT, BKT, RBT, CUT	2616.9 *	4	7.4
Tonahutu Creek	Below 2733 m	BNT, BKT, CUT	2622.99 *	4	1.77
Colorado River	Park boundary to gaging station at 2672 m	BNT, BKT, LNS, RBT, WS, SCU	2641.29 *	4	10.46
Sprague Lake		BNT, BKT, RBT	2647.4	4	5.16
Onahu Creek	Colorado River to 2745 m	BNT, BKT, SCU	2668.74 *	4	4.18
Baker Creek		BNT, BKT	2680.94	4	4.02
Unnamed stream	Runs out of Bowen Gulch	BNT, BKT, LNS, SCU, WS, RBT	2683.99	4	0.8
Colorado River	Gaging station at 2672 m to 2806 m	BNT, BKT, SCU	2708.4 *	4	14.09
Boulder Brook	Below 2708 m	BNT, BKT	2720.59	4	1.61
Hidden Valley Creek	2727 m to 2806 m	BNT, GBC(A), BKT	2766.34	1	2.89
North Fork Big Thompson River	Below Lost Falls	BNT, GBC(A), BKT	2859.37	4	4.83
North St Vrain Creek	Copeland Falls to Falcon Lake	BNT, CUT, BKT	2982.9	4	9.01
Icy Brook	Glacier Creek to 3013 m	BNT, BKT	2992.04	4	0.48
Cascade Creek	Below Mirror Lake	BNT, BKT	3143.02	4	6.44
Grand Ditch		BNT, CUT	3158.57	6	23.35
Mirror Lake		BNT, BKT	3361.09	4	8.4

TABLE 8. RMNP RAINBOW TROUT WATERS BY ELEVATION, BIOLOGICAL STATUS AND HECTARES/KILOMETERS, 2000

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Big Thompson River	Bear Lake Road to 2477 m, through Moraine Park	RBT, BNT, BKT, LNS	2443.04 *	4	4.67
Big Thompson River	2477 m to 2574 m	RBT, BKT, BNT, GBC	2479.65 *	4	3.22
Mill Creek	Below 2599 m	RBT, BNT, BKT	2488.79 *	4	2.41
Pool, The		RBT, BKT, BNT, GBC	2531.49	4	
Copeland Lake		RBT, BKT	2537.9	6	
Roaring River	Fall River to Horseshoe Falls	RBT, GBC, BKT, BNT	2546.74 *	4	0.48
Fall River	Point S of Sheep Lake to Fan Lake	RBT, BKT, BNT, GBC	2592.49 *	4	1.61
Glacier Creek	Below Prospect Canyon	RBT, BKT, BNT, CUT	2616.9 *	4	7.4
Colorado River	Park boundary to gaging station at 2672 m	RBT, BNT, BKT, LNS, WS, SCU	2641.29 *	4	10.46
Sprague Lake		RBT, BKT, BNT	2647.4	4	5.16
Unnamed stream	Runs out of Bowen Gulch	RBT, BKT, BNT, LNS, SCU, WS	2683.99	4	0.8
Fall River	Chasm Falls to 2879 m	RBT, CUT, BKT	2758.72 *	4	1.93
Glacier Creek	Prospect Canyon to Glacier Falls	RBT, BKT	2966.12 *	4	2.25
Jewel Lake		RBT	3031.69	4	1.83
Mills Lake		RBT	3033.22	4	6.24
Glacier Creek	Glacier Falls to 3074 m	RBT, BKT, CUT	3043.28	4	1.12
Glacier Creek	3074 m to 3111 m	RBT, CUT(B+), BKT	3092.69	3	0.32

TABLE 9. RMNP WATERS BY ELEVATION, BIOLOGICAL STATUS AND HECTARES/KILOMETERS, 2000

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Big Thompson River	Below Bear Lake Road	BKT	2403.4	4	0.64
Pole Creek		Barren	2439.99 *	5	2.41
Big Thompson River	Bear Lake Road to 2477 m, through Moraine Park	BNT, BKT, RBT, GBC, WS, LNS	2443.04 *	4	4.67
West Creek	Below West Creek Falls	BKT, GBC	2468.97	4	0.48
Black Canyon Creek	Below 2538 m	BKT	2473.54	4	2.09
Big Thompson River	2477 m to 2574 m	BKT, BNT, RBT, GBC	2479.65 *	4	3.22
Mill Creek	Below 2599 m	BNT, RBT, BKT	2488.79 *	4	2.41
Unnamed pond	Along Big Thompson River, near Windy Gulch	BKT	2497.94	4	
Beaver Brook		Barren	2500.99 *	5	9.82
North St Vrain Creek	Below Copeland Falls	BNT, BKT, CUT	2531.49 *	4	2.41
Pool, The		BKT, BNT, RBT, GBC	2531.49	4	
Copeland Lake		RBT, BKT	2537.9	6	
Colorado River	Below Shadow Mountain Dam	BKT, BNT, LNS, SCU	2539.12	4	2.25
Roaring River	Fall River to Horseshoe Falls	BKT, GBC, BNT, RBT	2546.74 *	4	0.48
Cub Creek		Unknown	2552.84	6	1.93
Ranger Creek		Barren	2561.99 *	5	2.57
Bighorn Creek		Barren	2561.99 *	5	3.38
Cow Creek	Below Bridal Veil Falls	BKT, BNT	2574.19	4	3.86
Fall River	Below point S of Sheep Lakes	BNT, LNS, BKT	2577.24 *	4	3.22
East Inlet	Below Adams Falls	BNT, BKT	2583.34	4	0.16
Fall River	Point S of Sheep Lake to Fan Lake	BKT, BNT, GBC, RBT	2592.49 *	4	1.61
North Inlet	Below Cascade Falls	BNT, BKT, SCU	2592.49 *	4	4.02
Sheep Lakes	S	Barren	2594.94	5	
Sheep Lakes	N	Barren	2598.59	5	
Columbine Creek	Colorado River to 2733 m	BKT	2601.65	4	2.09
Hunters Creek	North St Vrain Creek to 2623 m	Unknown	2604.69	6	0.16
Aspen Brook		Barren	2606.22	5	2.81
Fan Lake		BKT, GBC	2607.74	4	
Glacier Creek	Below Prospect Canyon	BKT, BNT, RBT, CUT	2616.9 *	4	7.4
Mill Creek	2599 m to 2806 m	BKT	2622.99 *	4	2.41
Echo Creek	Below 2928 m	BKT	2622.99 *	4	1.77
West Creek	West Creek Falls to 2720 m	GBC(A)	2622.99 *	2*	3.05
Tonahutu Creek	Below 2733 m	BKT, BNT, CUT	2622.99 *	4	1.77
Sandbeach Creek	North St Vrain Creek to 2660 m	Unknown	2633.67	6	0.4
Cub Lake		Barren	2635.19	5	4.04
Colorado River	Park boundary to gaging station at 2672 m	BNT, BKT, LNS, RBT, WS, SCU	2641.29 *	4	10.46
Sprague Lake		BKT, RBT, BNT	2647.4	4	5.16
Fall River	Fan Lake to Chasm Falls	BKT	2647.4 *	4	3.54
Fern Creek	Big Thompson River to Fern Falls	Unknown	2647.4	6	0.64
Hidden Valley Creek	Fall River to 2727 m	Unknown	2658.07	6	1.12
Unnamed stream	W branch of Hidden Valley Creek, near Fall River jct	Barren	2659.59	5	0.8
Wind River	Below 2696 m	BKT	2659.59 *	4	1.93
East Inlet	Adams Falls to falls at 2745 m	BKT	2664.17	4	4.18
Spruce Creek	Big Thompson River to 2769 m	Barren	2665.69	5	1.28

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Onahu Creek	Colorado River to 2745 m	BKT, BNT, SCU	2668.74 *	4	4.18
Baker Creek		BKT, BNT	2680.94	4	4.02
Unnamed stream	Runs through Windy Gulch	Barren	2682.47	5	1.93
Harbison Ditch		Unknown	2683.99	6	2.25
Sundance Creek	Below Thousand Falls	BKT	2683.99	4	0.32
Unnamed stream	Runs out of Bowen Gulch	BKT, BNT, LNS, SCU, WS, RBT	2683.99	4	0.8
Gem Lake		Barren	2693.15	5	0.08
Sandbeach Creek	2660 m to 2745 m	GBC(B+)	2702.3	3	2.57
Fox Creek		Barren	2708.4 *	5	5.15
Colorado River	Gaging station at 2672 m to 2806 m	BNT, BKT, SCU	2708.4 *	4	14.09
Cabin Creek	Below 2867 m	BKT	2714.49 *	4	1.93
West Creek	Above 2720 m	Barren	2720.59	5	6.28
Timber Creek	Below 2867 m	BKT	2720.59 *	4	0.96
Boulder Brook	Below 2708 m	BKT, BNT	2720.59	4	1.61
Lily Lake		GBC(A)	2722.73	7	6.8
Wind River	Above 2696 m	Barren	2726.69	5	1.28
Unnamed stream	Runs through Red Gulch, below 2782 m	BKT	2754.15	4	0.4
Horse Creek		Barren	2757.19 *	5	2.57
Fall River	Chasm Falls to 2879 m	CUT, BKT, RBT	2758.72 *	4	1.93
Black Pool		Unknown	2760.24	6	
Green Valley Stream		Barren	2761.77	5	3.22
Hidden Valley Creek	2727 m to 2806 m	BKT, GBC(A), BNT	2766.34	1	2.89
Cony Creek	North St Vrain Creek to Calypso Cascades	Unknown	2773.97	4	0.48
Spruce Creek	2769 m to 2781 m	BKT	2775.49	4	0.16
Columbine Creek	2733 m to 2794 m	CRC(A-)	2781.59 *	2	1.12
North Inlet	Cascade Falls to falls at 2891 m	CRC(B), BKT	2787.69	3	6.44
Unnamed stream	Bierstadt Lake drainage	Barren	2792.27	5	2.73
Roaring River	Horseshoe Falls to 2804 m	GBC(A)	2798.37 *	1	2.09
Fern Creek	Fern Falls to 3056 m	GBC(A)	2805.99 *	1	2.25
Unnamed stream	Runs through Crater Gulch	Barren	2818.19 *	5	3.38
Unnamed stream	Bear Lake drainage, below 2879 m	Unknown	2824.29	6	0.64
Chickaree Lake		Barren	2833.44	5	1.83
Ouzel Creek	North St Vrain Creek to Ouzel Falls	Unknown	2836.49	6	0.48
Unnamed stream	Spruce/Loomis Lakes drainage, below 2928 m	Barren	2853.27	5	0.64
Chaos Creek	Glacier Creek to 2952 m	Unknown	2854.79	6	1.44
North Fork Big Thompson River	Below Lost Falls	GBC(A), BKT, BNT	2859.37	4	4.83
Paradise Creek	East Inlet to 2904 m	Unknown	2859.37	6	0.8
Bierstadt Lake		Barren	2866.99	5	2.96
South Fork Cache la Poudre River	Below 2879 m	GBC(A)	2876.15	8	0.16
Tonahutu Creek	2733 m to Granite Falls	BKT, CRC	2879.19 *	4	6.28
Bear Lake		GBC(A)	2889.87	2	4.47
Unnamed stream	Bear Lake drainage, above 2879 m	GBC(A)	2891.4	2	0.16
Fern Lake		GBC(A)	2897.49	1	3.67
Ptarmigan Creek	North Inlet to War Dance Falls	Unknown	2912.74	6	0.64

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Paradise Creek	2904 m to 3026 m	CRC(A-)	2921.9 *	1^	1.93
Inn Brook		Barren	2926.47	5	3.22
Campers Creek		Barren	2927.99 *	5	3.05
Echo Creek	Above 2928 m	Barren	2927.99 *	5	2.81
Roaring River	Above 2804 m	GBC(A)	2927.99 *	1	5.79
Colorado River	Above 2806 m	BKT, CRC(A)	2927.99 *	4	5.63
Sandbeach Creek	2745 m to 3135 m	GBC(A-)	2940.19	1	0.64
Spruce Lake		GBC(A)	2940.19	1	1.48
Ouzel Creek	Ouzel Falls to 2989 m	BKT, GBC(A)	2952.4 *	1	1.44
North Inlet	Falls at 2891 m to 3026 m	CRC(B)	2952.4 *	3	3.7
Nymph Lake		Barren	2958.49	5	0.36
Hallett Creek		Barren	2958.49 *	5	3.38
Tyndall Creek	Below 2989 m	Unknown	2958.49	6	0.4
Unnamed stream	Pettingell Lake drainage	Barren	2960.02	5	2.25
Solitude, Lake		CRC(B)	2964.59	3	2.96
Glacier Creek	Prospect Canyon to Glacier Falls	BKT, RBT	2966.12 *	4	2.25
Onahu Creek	2745 m to 3196 m	BKT	2970.69	4	5.23
Hunters Creek	2623 m to Lyric Falls	GBC(A)	2972.22 *	8	2.89
Roaring Fork	Below 3453 m	BKT	2978.32	4	7.56
Twin Lakes	W, aka Radcliff Ponds	Barren	2979.84	5	1.83
North St Vrain Creek	Copeland Falls to Falcon Lake	CUT, BKT, BNT	2982.9	4	9.01
Boulder Brook	Above 2708 m	Barren	2988.99 *	5	6.28
Chiquita Creek		Barren	2988.99 *	5	4.67
Icy Brook	Glacier Creek to 3013 m	BKT, BNT	2992.04	4	0.48
Lost Creek		Barren	2995.09	5	1.44
Tyndall Creek	2989 m to Dream Lake	GBC(A)	3002.72	6	0.32
Little Dutch Creek		Barren	3004.24	5	1.61
Lost Brook		Unknown	3005.77	6	1.44
Twin Lakes	E, aka Radcliff Ponds	Barren	3010.34	5	0.72
Fox Creek		Barren	3013.4 *	5	5.15
Lone Pine Lake		BKT	3014.92	4	5.16
East Inlet	Falls at 2745 m to 3294 m	BKT	3019.49	4	5.79
Mill Creek	Above 2806 m	Barren	3021.02	5	4.02
Dream Lake		GBC(A)	3022.54	6	2.2
Finch Lake		Barren	3022.54	5	2.96
Black Canyon Creek	Above 2538 m	Barren	3022.54	5	8.21
Unnamed stream	Spruce/Loomis Lakes drainage, above 2928 m	GBC(A)	3022.54	1	0.64
Big Thompson River	2574 m to 3242 m, through Forest Canyon	GBC(A-)	3025.59 *	1	12.56
La Poudre Pass Creek	Below Long Draw Reservoir	Unknown	3027.73	6	5.63
Unnamed stream	Finch Lake drainage	Barren	3028.65	5	0.16
Jewel Lake		RBT	3031.69	4	1.83
Cow Creek	Above Bridal Veil Falls	Unknown	3031.69	6	4.5
Mills Lake		RBT	3033.22	4	6.24
Beaver Creek		BKT	3037.79	4	5.47

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Alpine Brook		Barren	3042.37	5	4.99
Glacier Creek	Glacier Falls to 3074 m	RBT, BKT, CUT	3043.28	4	1.12
Tonahutu Creek	Granite Falls to 3099 m	CUT	3043.9	3	2.25
Odessa Lake		GBC(A)	3049.99	1	4.47
Ypsilon Creek	Below 3172 m	GBC(B+)	3049.99 *	3	2.41
Chickadee Pond		Barren	3053.04	5	0.36
Unnamed stream	Hazeline Lake drainage, below 3062 m	BKT, CUT(B+)	3053.04	3	0.16
Ouzel Creek	2989 m to 3087 m	BKT, GBC(A)	3062.19 *	1	1.12
Hague Creek	Cache la Poudre River to 3148 m	BKT	3065.24	4	5.79
Unnamed stream	Fork #4 Onahu Creek, through Long Meadows	Unknown	3069.21	6	2.25
Middle Dutch Creek		Unknown	3071.34	6	0.8
Ouzel Lake		GBC(A), BKT	3080.49	1	2.56
Cache la Poudre River		BKT	3080.49 *	4	16.1
Unnamed stream	Fork #1 Cony Creek	Barren	3080.49 *	5	2.73
Columbine Creek	Above 2794 m	Barren	3080.49	5	3.86
Ptarmigan Creek	War Dance Falls to 3172 m	CRC(A)	3080.49	8	1.93
Emerald Lake		Barren	3083.54	5	2.56
Unnamed stream	Hazeline Lake drainage, 3062 m to 3111 m	CUT(B+)	3086.59	3	0.16
Primrose Lake		GBC(A)	3089.65	1	0.36
La Poudre Pass Creek	Above Long Draw Reservoir	CUT	3092.69	3	2.25
Glacier Creek	3074 m to 3111 m	CUT(B+), BKT, RBT	3092.69	3	0.32
Bench Lake		CRC(A)	3095.74	8	2.56
Unnamed stream	Runs through Red Gulch, above 2782 m	Unknown	3095.74	6	3.22
Lady Creek		Barren	3098.79	5	1.28
Willow Creek	Below 3184 m	BKT	3098.79	4	4.99
Icy Brook	3013 m to Timberline Falls	GBC(B)	3098.79	3	1.28
Paradise Creek	3026 m to 3172 m, through Paradise Park	CRC(B)	3098.79	3	3.7
Unnamed stream	Fay Lakes drainage, below 3111 m	CRC(B+)	3100.32	3	0.32
Chaos Creek	2952 m to Lake Haiyaha	YCT	3104.9 *	4	0.64
Loch, The		GBC(B)	3110.99	3	5.87
Verna, Lake		BKT	3110.99	4	13.24
Cony Creek	Calypso Cascades to Upper Hutcheson Lake	GBC(A)	3110.99 *	1	5.79
Lulu Creek		Barren	3116.48	5	4.34
Haiyaha, Lake		YCT	3117.09	4	6.24
Marigold Lake		Barren	3117.09	5	0.08
Unnamed stream	Lake Nokoni drainage	Unknown	3119.53	6	1.44
Loomis Lake		GBC(A)	3123.19	7	1.11
Unnamed stream	Eagle Lake drainage, below Martensia Falls	Unknown	3123.19	6	0.4
Unnamed ditch	Runs from Specimen Creek to La Poudre Pass	Unknown	3124.11	6	2.57
Unnamed stream	Lake Nanita drainage, below 3282 m	Unknown	3124.72	6	1.12
Bennett Creek		Barren	3126.24 *	5	2.89
Unnamed stream	Forest Lake drainage	Unknown	3128.99	6	0.48
Sundance Creek	Above Thousand Falls	Barren	3129.29	5	3.54
Little Rock Lake		CUT(B+)	3135.4	3	0.28

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Hidden Valley Creek	Above 2806 m	Barren	3135.4	5	3.38
Big Dutch Creek		Barren	3138.44	5	3.86
Spirit Lake		BKT, CRC	3138.44	4	7.35
Sandbeach Creek	3135 m to Sandbeach Lake	GBC(A)	3138.44	1	0.16
Forest Lake		Barren	3141.49	5	2.96
Rock Lake		CUT(B+)	3141.49	3	2.2
Sandbeach Lake		GBC(A)	3141.49	1	6.6
Cascade Creek	Below Mirror Lake	BKT, BNT	3143.02	4	6.44
Round Pond		Barren	3153.69	5	0.08
Grand Ditch		CUT, BNT	3158.57	6	23.35
Embryo Lake		Barren	3159.79	5	0.04
Hague Creek	3148 m to 3172 m	CUT(A-)	3159.79	3^	0.8
Ouzel Creek	3087 m to 3233 m	GBC(A)	3159.79	1	0.96
Unnamed stream	Snowdrift Lake drainage, below 3172 m	CRC(A)	3159.79	2	0.16
Unnamed stream	Fork #4 Ptarmigan Creek, below 3172 m	CRC(A)	3165.9	2	0.16
Fourth Lake		BKT	3168.94	4	2.96
Unnamed stream	Lake Helene drainage	Barren	3168.94	5	0.48
Unnamed lake	On fork #15 North Inlet, lower, smaller	Barren	3168.94	5	
Specimen Creek		Barren	3171.99 *	5	3.38
Chapin Creek		BKT	3171.99 *	4	4.83
Hayden Creek		Barren	3171.99 *	5	6.92
Glacier Creek	3111 m to Black Lake	BKT	3171.99	4	1.12
Spruce Creek	Above 2781 m	Barren	3176.26	5	4.42
Pear Creek		GBC(A)	3179.92	1	1.12
Phantom Creek		Barren	3184.19 *	5	3.22
Squeak Creek		Barren	3196.4 *	5	4.18
Ypsilon Creek	3172 m to Ypsilon Lake	CRC(A-)	3196.4	3	0.32
Mummy Pass Creek	Below 3306 m	BKT	3200.97	4	1.93
Tonahutu Creek	Above 3099 m	Barren	3200.97	5	2.01
Unnamed stream	Eagle Lake drainage, Martensia Falls to 3233 m	BKT	3202.49	4	0.48
Unnamed stream	Gorge Lakes drainage, below Arrowhead Lake	CUT(B+)	3204.02	3	2.57
Pettingell Lake		CUT(B+)	3205.54	3	4.04
Willow Creek	Above 3184 m	CUT(B+), BKT	3205.54 *	3	3.22
Unnamed stream	Fay Lakes drainage, 3111 m to 3300 m	GBC(A)	3205.54	1	1.28
Unnamed stream	Fork #2 Willow Creek, below 3221 m	CUT(B+), BKT	3214.69	3	0.16
Ypsilon Lake		CRC(A-)	3214.69	3	2.96
Tourmaline Lake		Barren	3220.79	5	0.72
Mosquito Creek		Barren	3222.32	5	3.54
Opposition Creek		Barren	3222.32	5	3.54
Thunder Lake		CUT(B), BKT	3225.06	3	6.6
Marigold Pond		Barren	3226.9	5	0.04
Pear Lake		GBC(A)	3226.9	1	6.6
Sawmill Creek		Barren	3228.42	5	5.31
Unnamed lake	On fork #15 North Inlet, upper, larger	Barren	3229.94	5	

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Black Lake		BKT	3232.99	4	3.67
Helene, Lake		Barren	3232.99	5	1.11
Two Rivers Lake		Barren	3232.99	5	1.83
Irene, Lake		Barren	3232.99	5	0.28
Tyndall Creek	Above Dream lake	Barren	3232.99 *	5	2.25
Unnamed stream	Haynach Lakes drainage	YCT(B)	3235.44	4	2.41
Unnamed stream	Lost Lake drainage	GBC(A)	3238.18	1	0.96
Castle Lakes	S of Castle Lake, E	Unknown	3239.09	6	
Castle Lakes	S of Castle Lake, W	Unknown	3239.09	6	
Unnamed stream	Box Lake drainage	BKT	3240.62	4	0.64
Junco Lake		Barren	3242.15	5	3.67
Fern Creek	Above 3056 m	Barren	3242.15	5	1.77
Paradise Creek	3172 m to Boundary Lake	CRC(B+)	3242.15	3	2.41
Onahu Creek	3196 m to 3294 m	CRC(A-)	3245.19	1	1.12
Unnamed stream	Lion Lakes drainage, below Thunder Falls	BKT	3246.72	4	1.12
Chipmunk Lake		Barren	3248.24	5	0.04
Fall River	Above 2879 m	Barren	3248.24 *	5	5.79
Unnamed stream	Adams Lake drainage	CRC(A)	3248.24	1	2.09
Icy Brook	Timberline Falls to 3315 m	GBC(B), BKT	3249.77	3	0.48
Unnamed stream	Tourmaline Lake drainage	Barren	3251.29	5	1.77
Cabin Creek	Above 2867 m	Unknown	3251.29	6	2.41
Unnamed stream	Murphy Lake drainage	Unknown	3257.4	6	1.61
Unnamed stream	Blue Lake drainage	Barren	3261.97	5	0.96
Unnamed stream	Fork #4 Ptarmigan Creek, above 3172 m	Barren	3268.07	5	0.96
North Inlet	3026 m to Lake Powell	Barren	3269.59	5	3.7
Larkspur Creek		Barren	3272.65	5	0.96
Lost Lake		GBC(A)	3275.69	1	3.67
Unnamed stream	Fork of Mummy Pass Creek, below 3294 m	BKT	3277.22	4	0.32
Unnamed stream	Fork #13 Big Thompson River	Unknown	3277.22	6	4.02
Caddis Lake		GBC(A)	3278.74	1	0.28
Unnamed stream	Snowdrift Lake drainage, above 3172 m	Barren	3280.27	5	0.8
Box Lake		BKT	3281.79	4	2.56
Poudre Lake		BKT	3281.79	4	5.52
Timber Creek	Above 2867 m	CRC(A)	3281.79 *	1	4.18
Nokoni, Lake		Barren	3287.9	5	9.96
Nanita, Lake		CRC(A)	3290.94	1	13.6
Unnamed stream	Lake Nanita drainage, 3282 m to Lake Nanita	CRC(A)	3290.94	8	0.24
North Fork Big Thompson River	Lost Falls to 3367 m	GBC(A), BKT	3293.99 *	1	4.67
East Inlet	3294 m to Fifth Lake	CRC(A-)	3298.57	1	0.16
Glass Lake		GBC(B), BKT	3300.09	3	1.83
Unnamed stream	Hayden Lake drainage	Barren	3300.09	5	0.64
Hidden River		Unknown	3303.15	6	2.25
Eagle Lake		Barren	3306.19	5	4.76
Unnamed stream	Hourglass Lake drainage	Barren	3307.72	5	1.12

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Lower Hutcheson Lake		GBC(A)	3309.86	1	1.71
Fifth Lake		CRC(A-)	3312.29	1	2.96
Andrews Creek		Unknown	3316.87	6	1.61
Unnamed stream	Hazeline Lake drainage, above 3111 m	Barren	3316.87	5	2.89
Sky Pond		BKT	3318.4	4	4.47
Boundary Lake		CRC(A)	3318.4	1	0.72
Unnamed stream	Potts Puddle drainage	Barren	3318.4	5	
Icy Brook	3315 m to Sky Pond	BKT	3318.4	4	0.16
Big Thompson River	Above 3242 m	Barren	3322.97	5	1.12
Grouse Creek		Barren	3324.49 *	5	2.25
Potts Puddle		Barren	3324.49	5	1.48
Unnamed stream	Lake Nanita drainage, above Lake Nanita	Barren	3326.02	5	0.64
Chaos Creek	Above Lake Haiyaha	Barren	3327.54	5	2.25
Onahu Creek	3294 m to Julian Lake	CRC(A-)	3332.12	1*	0.64
Bighorn Lake		Barren	3333.65	5	0.36
Hunters Creek	Lyric Falls to Keplinger Lake	Barren	3335.17	5	3.86
Ypsilon Creek	Above Ypsilon Lake	Barren	3338.22	5	1.12
Unnamed stream	Doughnut Lake drainage	Barren	3347.37	5	0.96
Bluebird Lake		Barren	3348.28	5	8.8
Unnamed lake	On NF Big Thompson River, below Lake Dunraven, lower	GBC(A)	3348.9	1	
Unnamed stream	Indigo Pond drainage	Barren	3350.42	5	1.12
Unnamed lake	On NF Big Thompson River, below Lake Dunraven, upper	GBC(A)	3351.94	1	
Unnamed lake	On Hayden Creek, above fork #3 jct.	Barren	3351.94	5	
Lawn Lake		GBC(A)	3354.99	1	7.99
Unnamed stream	Lake Louise drainage	GBC(A)	3358.04	1	0.48
Ouzel Creek	Above 3233 m	Barren	3358.04	5	1.12
Fay Lake		Barren	3361.09	5	1.83
Mirror Lake		BKT, BNT	3361.09	4	8.4
Unnamed stream	Lonesome Lake drainage	Barren	3361.09	5	1.93
Haynach Lakes	Lower , smaller lake	YCT(B)	3364.15	4	
Husted, Lake		GBC(A)	3367.19	7	4.04
Louise, Lake		GBC(A)	3367.19	7	2.56
Mummy Pass Creek	Above 3306 m	Barren	3367.19	5	1.28
Unnamed stream	Spectacle Lakes drainage	Barren	3368.72	5	0.48
Falcon Lake		Barren	3373.29	5	1.83
Middle Hutcheson Lake		GBC(A)	3373.29	1	0.99
Timber Lake		CRC(A)	3373.29	1	4.04
Lion Lake No. 1		Barren	3374.82	5	2.96
Glacier Creek	Black Lake to Green Lake	Barren	3377.87	5	1.61
Haynach Lakes	Upper, larger lake	YCT(B)	3379.4	4	2.56
Julian Lake		Barren	3385.49	5	2.2
Shelf Creek		Barren	3385.49	5	2.09
Unnamed stream	Lake of Many Winds drainage	Barren	3385.49	5	1.61
Unnamed stream	Frozen Lake drainage	Barren	3387.02	5	0.64

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Hazeline Lake		Barren	3388.54	5	2.96
Unnamed stream	Fork of Andrews Creek, runs through The Gash	Unknown	3393.12	6	0.8
Blue Lake		Barren	3397.69	5	1.11
Icy Brook	Above Sky Pond	Barren	3399.22	5	0.48
Arrowhead Lake		GBC(A-)	3399.52	1	13.96
Castle Lake		Barren	3403.79	5	0.72
Hayden Lake		Barren	3403.79	5	2.96
Indigo Pond		Barren	3403.79	5	0.28
Snowdrift Lake		Barren	3403.79	5	3.67
Unnamed stream	Rainbow/Irene Lakes drainage	Barren	3403.79	5	0.96
Hague Creek	Above 3172 m	Barren	3403.79	5	4.83
Ptarmigan Creek	Above 3172 m	Barren	3403.79	5	1.61
Cascade Creek	Above Mirror Lake	Barren	3405.32	5	0.64
Unnamed lake	On Cony Creek, below Upper Hutcheson Lake, lower	GBC(A)	3409.9	1	
Unnamed lake	On Cony Creek, below Upper Hutcheson Lake, upper	GBC(A)	3411.42	1	
Hourglass Lake		Barren	3415.99	5	3.67
Upper Hutcheson Lake		GBC(A)	3415.99	1	2.96
Ten Lake Park Lake	Large, E	CRC(C)	3415.99	3	4.87
Faylene Lake		Barren	3419.04	5	1.83
Adams Lake		CRC(A)	3419.04	1	1.83
Unnamed stream	Eagle Lake drainage, above 3233 m	Barren	3419.04	5	1 2
Shelf Lake		Barren	3422.09	5	1.48
Murphy Lake		Barren	3422.09	5	2.96
Ten Lake Park Lake	Large, W	Barren	3425.15	5	
Unnamed stream	Haynach Lakes drainage, above largest Haynach Lake	Barren	3428.19	5	0.64
Doughnut Lake		Barren	3431.24	5	2.96
Peacock Pool		BKT	3434.29	4	1.83
Unnamed lake	On fork #13 Big Thompson River, lowest	Barren	3437.34	5	
Love Lake		Barren	3440.4	5	0.72
Pinnacle Pool		Barren	3446.49	6	1.44
East Inlet	Above Fifth Lake	Barren	3451.07	5	0.8
Lark Pond		Barren	3452.59	5	1.83
South Fork Cache la Poudre River	Above 2879 m	Barren	3452.59	5	7.89
Chiquita Lake		Barren	3461.74	5	1.48
Lower Spectacle Lake		Barren	3461.74	5	2.96
Cony Creek	Above Upper Hutcheson Lake	Barren	3463.57	5	0.8
Dunraven, Lake		Barren	3464.79	5	4.47
Unnamed lake	On fork #13 Big Thompson River, 2nd lowest	Barren	3467.84	5	
Unnamed stream	Lion Lakes drainage, above Thunder Falls	Barren	3469.37	5	2.25
Unnamed lake	On fork #13 Big Thompson River, 3rd lowest	Barren	3470.9	5	
Unnamed lake	On Hunters Creek, below Keplinger Lake	Barren	3470.9	5	
Unnamed lake	On fork #13 Big Thompson River, 4th lowest	Barren	3472.42	5	
Unnamed lake	On fork #13 Big Thompson River, highest	Barren	3473.94	5	
Andrews Tarn		Barren	3476.99	5	0.95

TABLE 9. CONTINUED

Water	Location	Species	Mean Elevation(m) or * Survey Elevation(m)	Biological Status	Hectares/ Kilometers
Lion Lake No. 2		Barren	3476.99	5	1.48
Pipit Lake		Barren	3476.99	5	5.16
Upper Spectacle Lake		Barren	3476.99	5	4.47
Solitude Lake		Barren	3483.09	5	2.96
Unnamed lake	On North Inlet, below Lake Powell	Barren	3483.09	5	
Lake of the Clouds		Barren	3486.15	5	4.47
Unnamed stream	Desolation Peaks Lake drainage	Barren	3487.67	5	2.73
Ptarmigan Lake		Barren	3495.29	5	8.44
Inkwell Lake		Barren	3507.49	5	12.12
Little Crystal Lake		Barren	3510.54	5	1.48
Unnamed lake	On fork #4 Hague Creek, middle	Barren	3510.54	5	
Cony Lake		Barren	3511.15	5	6.6
Crystal Lake		GBC(A)	3513.59	7	9.92
Snowbank Lake		Barren	3513.9	5	2.96
Roaring Fork	Above 3453 m	Barren	3514.51	5	0.8
Powell, Lake		Barren	3522.74	5	5.16
Frozen Lake		Barren	3525.79	5	2.96
Green Lake		Barren	3531.9	5	1.48
Unnamed stream	Fay Lakes drainage, above 3300 m	Barren	3537.99	5	2.25
Lake of Many Winds		Barren	3541.04	5	0.36
Unnamed stream	Junco Lake drainage	Barren	3541.04	5	1.93
Keplinger Lake		Barren	3564.23	5	3.67
Lonesome Lake		Barren	3568.49	5	2.96
Rainbow Lake		Barren	3580.69	5	5.16
Chasm Lake		Barren	3586.79	5	7.72
Unnamed stream	Gorge Lakes drainage, above Arrowhead Lake	Barren	3589.84	5	1.28
Eureka Ditch		Unknown	3595.64	6	1.28
Frigid Lake		Barren	3598.99	5	4.76
Irene Lake		Barren	3611.19	5	0.72
Sprague Glacier Lake		Barren	3617.29	5	2.2
Azure Lake		Barren	3629.49	5	5.52
Desolation Peaks Lake		Barren	3632.54	5	
Iceberg Lake		Barren	3656.94	5	0.08
Isolation Lake		Unknown	3659.99	6	
North Fork Big Thompson River	Above 3367 m	Barren	3679.82	5	3.38
Highest Lake		Barren	3789.62	5	2.96
Rowe Glacier Lake		Barren	3995.49	5	2.96

Table 10. Fish Population and Substrate Changes, Following the Lawn Lake Flood, Fall River Downstream of Roaring River, RMNP 1980-1987.

Fall River, South of Lawn Lake Trailhead

Ave. No. Fish/100' and length (mm)

Date	BKT	BNT	LNS
9/9/80	63 (159)	1.7 (196)	29.6 (258)
10/7/82	6 (195)	0.0	0.0
9/19/85	5.7 (180)	0.0	3.0 (80)

Comments. Prior to the flood riffle substrate was mainly gravel and cobble. Following the flood (Oct. 1982), bottom was mainly shifting sand. By October 1986, bottom returning to mainly gravel and cobble in the riffle areas. By October 1987, this area was a beaver pond.

Fall River 300' Downstream of Fall River Bridge

Ave. No. Fish/100' and length (mm)

Date	BKT	BNT	LNS
9/9/80	46.7 (146)	2.7 (209)	6.3 (258)
10/7/82	2.3 (260)	1.0 (166)	0.0
9/19/85	17.0 (172)	0.0	1.3 (104)
10/02/87	35.0 (139)	18.7 (110)	5.4 (139)

Comments: Prior to flood riffle substrate was mainly gravel and rubble.

Following the flood, bottom was mainly drifting sand, with braded fish observed 7 October 1982. By October 1986, bottom returning to rubble and gravel, with brook trout returning. Some algae on substrate by October 1986. Recovery continued into 1987, with increase of algae and the return of brown trout.

Table 10 continued.

Date	BKT	BNT	LNS
	Ave. No. Fish/100' and length (mm)		
9/9/80	5.7 (169)	6.7 (210)	9.3 (263)
10/7/82	8.0 (159)	10.0 (182)	16.3 (269)
9/19/85	6.0 (168)	0.7 (368)	22.6 (125)
10/02/87	8.7 (93)	0.0	10.5 (140)

Comments: Fish appeared to wash into this section by October 1982. Moving sand has dramatically changed this section. Prior to the flow, section had pools to 4' in depth but by 1986, no pools exceeded two feet in depth. Volume of section was estimated at 0.062 ACF, 7 October 1982, but decreased to 0.043 ACF by 22 October 1986.

The habitat of this section is now more suited to suckers than trout. Prior to the Flood (1981), substrate of this section was silt and sand over gravel. After the flood, the substrate changed to deep shifting, with sand accumulation and habitat losses continuing through 1988.

Table 11. Stream Surveys RMNP, 1984

	Sundance	Chiquita	Fox Creek	Grouse Creek
Date	8/2/84	8/2/84	8/3/84	8/3/84
Drainage	Fall R	Fall R	No. Fork	No. Fork
Elevation				
Flow	3	3	2	1
Flow/var	2	3	2	1
Temp	44	44	49	50
Velocity	NS	NS	NS	NS
Hiding	NS	NS	NS	NS
Substrate	NS	NS	NS	NS
Width	NS	NS	NS	NS
x depth	NS	NS	NS	NS
Bank	NS	NS	NS	NS
% pools	NS	NS	NS	NS
2' pools	NS	NS	NS	NS
% rooted veg.	NS	NS	NS	NS
CFS	6.86	4.4	0.29	0.09
Fish	BKT/barren	barren	barren	barren
Ave LN mm	185/0			
#/300'				
LBS/AC				

Table 12. Stream Surveys RMNP, 1985

	Horse Cr.	Cabin Cr.	Willow Cr.	Fox Cr.	Alpine	Inn	Roaring	Willow Cr.	Hayden Cr.
Date	6/25/85	6/25/85	6/25/85	6/25/85	7/23/85	7/23/85	7/23/85	8/12/85	8/12/85
Drainage	Roaring/ Cabin	Roaring/ Cabin	N.St.Vrain	N.St.Vrain	Roaring/ Cabin	Roaring/ Cabin	Roaring/ Cabin	Poudre	Big Thompson
Elevation	9040	8900	8880						
Flow	1	3	2	1	2	3	NS	NS	3-4
Flow/var	3	3	3	0	3	3	NS	NS	3
Temp	40F	44F	40F	40F	44F	44F	56F	36-51F	54F
Velocity	3	4	2	2	3	2	NS	NS	NS
Hiding	1	2	0	0	2	2	NS	NS	3
Substrate	3	3	2	0	0	1	NS	NS	2
Width	2-4'	5-4'	4'	2-3'	2-6'	2-6'	NS	NS	NS
x depth	< 1'	<2.2'	<1.6'	NS	NS	NS	NS	NS	NS
Bank	4	3	4	4	4	4	NS	NS	4
% pools	NS	20-30..	NS	NS	50%	NS	NS	NS	NS
2' pools	NS	NS	NS	NS	NS	NS	NS	NS	NS
% cling. veg.	20%	NS	70%	NS	0	0	NS	NS	NS
% rated veg.	0	0	0	NS	0	0	NS	NS	0
CFS	3.44	3.7	1.2	0.20	2.1	NS	3.75	5.3	NS
Fish	0	BKT	0	0	0	0	BKT	Cutt/BKT	0
Ave/LN mm	0	210	0	0	0	0	NS	220/189	0
#/300'	0		0	0	0	0	NS	NS	0
LBS/AC	0		0	0	0	0	NS	NS	0

Table 13. Stream Surveys RMNP, 1986

	Beaver Mds.	Phantom	Un-named E of Finch	Wind R	Boulder	Squeak Cr.	Crater Cr.	Col. R.	Bighorn Cr.
Date	7/25/86	7/8/86	7/25/86	7/15/86	7/14/86	7/18/86	7/18/86	7/17/86	7/16/86
Drainage	Big Thomp.	Col. R.	N.St.Vrain	Glacier	Glacier	Col.R.	Col. R.	Col. R.	Fall R.
Elevation	8200	10,440	10,100	8720	9800	10,480	9240	9600	8400
Flow	1	0	3	3	3	0	2	3	1
Flow/var	2	3	3	3	3	2	2	3	0
Temp	59	41	43	44	42	45	45	45	50
Velocity	2	3	4	2	4	2	4	4	1
Hiding	2	3	2	2	3	2	2	3	3
Substrate	2	4	2	4	4	4	2	4	4
Width	3.3'	1.5'	5.4'	5.8'	7.8'	4.8'	7.8'	12.2'	2.9'
x depth	0.82'	0.5'	0.97'	0.78'	0.96'	0.32'	0.47'	0.5'	0.21'
Bank	2	4	4	3	4	4	1	4	3
% pools	1		40	20	50	30	25	40	15-20
2' pools	0		0	3	4	0	1	1	2
% cling. veg.	5-10		70	0	0	5	0	0	50
% rooted veg.	.5		0	0	0	0	0	0	0
CFS	0.71	2.8	7.16	2.62	8.11		1.86	5.13	0.20
Fish	barren	barren	barren	BKT	barren	barren	barren	BKT	barren
AVE/LN mm				94				200.6	
#/300'				32				5	
LBS/AC									

Table 14. Stream Surveys RMNP, 1987

	Bennett Cr.	Cache la Poudre	Chapin	Columbine	Echo	Echo Cr.	North Inlet	Onahu Cr.	Pole Cr.	Ranger	Specimen Cr
Date	7/22/87	7/23/87	7/23/87	7/29/87	7/27/87	7/27/87	7/6/87	7/30/87	7/28/87	7/28/87	7/22/87
Drainage											
Elevation	10250	10000	10400	9200	9600	8600		10000	8600	8400	10400
Flow	2	4	3	4	2	2	4	2	1	1	2
Flow/var	1	3	3	2	2	2	3	3	2	2	2
Temp	48F	66F	64F	50F	49F	48F	50F	48F	50F	46F	46F
Velocity	2	3	2	2	2	3	3	3	1	0	0
Hiding	2	2	2	4	4	4	3	3	3	4	3
Substrate	2	2	2	2	2	2	4	2	3	3	2
Width	1.69m	14'9"	6'7"	11'9"	4'9"	5'4"	17'4"	10'6"	2'4"	2'4"	1'7"
x depth	.34m	.68ft	.40ft	.84ft	.47ft	.36ft	1.76ft	.76ft	2.34ft	.30ft	1.61ft
Bank	3	4	4	4	4	4	4	4	3	2	4
% pools	20-30	15	30-40	50-60	50	NS	50	40	10-20	40-50	50
2' pools	1	1-2	0	4	3	NS	2	3	0	1	NS
% cling. veg.	5%	40%	0	3-5%	60%	NS	0	10-20%	10%	0	10%
% rooted veg.	0	0	10%	0	0	0	0	0	0	NS	0
CFS	0.1	4.69	0.41	3.44	1.35	0.40	15.05	1.06	0.02	0.01	1.68
Fish	0	BKT	BKT	CUTT	0	BKT	CUTT	BKT/CUH	0	0	0
Ave/LN mm		12.7	152	184		176	212	205			
#/300'		19.0	33.0								
LBS/AC		10.0									

Table 15. Stream Surveys RMNP, 1988

	Chaos Creek	Cache la Poudre	La Poudre Pass Cr. (ditch)	Tonahatu Creek	Tonahatu Creek	Onaha Creek	Lady Creek	Little Dutch Creek	Shelf Creek	Tyndal Cree
Date	7/25/88	8/24/88	8/05/88	8/16/88	8/17/88	8/9/88	8/3/88	8/3/88	7/26/88	7/28/
Drainage	Poudre	Col. R	Col. R	Col. R	Col. R	Col. R	Col. R	Col. R	B. Thom.	B. Tho
Elevation	10,180	10,120		9,440	9,300	11,000		9,240	11,200	10,600
Flow	3	3	1	4	4		1	0	0	
Flow/var	2	2	0	2	2			0		
Temp	51	64	41	49	48	48	47	47	50	42
Velocity		0.71	1.4	1.27	0.94					
Hiding	4	2	1	3	2					
Substrate	0	2	0	2	3					
Width	19.8	15.2	20.0	16.4	10.6					
$\bar{x}$ depth	1.27	0.26	1.3	0.78	1.28					
Bank	4	4	4	4	4					
% Pools	30%	40%	60%	50%	50%				0%	
2'Pools	3	2	0	2	- 0%				0%	
% Cling Veg.	50%	0%	0%	5%	5%					
% rooted Veg.	0%	0%	0%	0%	0%					
CFS	2.54	3.1	19.4	5.5	5.4		<0.1	<0.1	7.3	
Fish	Cutt	BKT	Cutt.	BKT	BKT	Cutt. Cr.	none	none	none	non
Ave.ln mm		159	to 380	149	130	274				
#/300'		63	<1	19	54					
LBS/AC ~~90.8~~		90.8	<1	23.3	51					

1/4 mile <Julian Lake

Table 15 continued.

	Hunters[1*] Creek	Hunters[2] Creek	Fern Creek	Glacier[3] Creek	Columbine Creek	Lost Creek	Hague Creek	Green Valley Creek	Red Gulch Creek
Date	10/5/88	10/5/88	10/20/88	7/25/88	10/6/88	8/03/88	8/25/88	8/01/88	8/02/88
Drainage	St.Vrain	St. Vrain	B. Thomp.	B. Thom.	Col. R	Col. R		Col. R.	Col. R.
Elevation	9,600	9,760	9,360	8,600	9,180	9.120	10,400		9,040
Flow	4	4	4	4	2	1	3		
Flow/var	3	3	2	3	2	2	3	1	2
Temp	38F	38F	36F	52F	39F	52F	52F	2 48F	2 46F
Velocity									
Hiding	3	4	3	2	3	2	4	2	2
Substrate	4	4	2	3	3	1	2	0	4
Width	10.7'	9.1'	9.9'	33'	11.1'	1.81'	11.7'	2.7'	6.3'
$\bar{x}$ depth	0.48'	0.63'	1.53'	0.76'	0.89'	0.16'	0.52'	0.45'	0.46
Bank	4	4	4	4	4	3	4	4	4
% Pools	40%	40%	50%	30%	50%	50%	70%	40%	30%
Pools	4	4	1	3	2	1	4	0	1
% Cling Veg.	10%	15%	40%	50%	10%	10%	1%	0%	3%
% rooted Veg.	0%	0%	0%	0%	0%	0%	0%	0%	0%
CFS	2.4	2.0	NS	58.4	1.2	<0.1	5.45	<0.1	1.6
Fish	CuttGB	CuttGB	CuttGB	BKT,BNT	Cutt.Cr.*	BKT	BKT	none	BKT
Ave.ln mm	174	190	112	BKT,122 BNT,246	134	25	187		94
#/300'	23	32	34		15	0>50mm	-		6
LBS/AC	45.6	87.1	20.9	-	14.7	-	-		7.3

1* AT Beaver will campsite
2* AT Sandbeach Trail
3 Heavy Rain, Flood condition

* taxonomic sample collected

Table 16.

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1984

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)*								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Arrowhead Lake	4	14	3.5	0.07	1	0							11			
Big Thompson River	9	12.5	1.38	1.6	2	0			18	0	1	0	6		5.88	7
Cache la Poudre River	1	2	2	0.5					1	0					10	
Chaos Creek	3	nd	-	-					24	0					7.25	
Fan Lake	27	23.25	0.86	0.21					5	0					8.2	
Glacier Creek	11	8.5	0.77	2.11	4	2			16	4	3	2	10		7	10
Hague Creek	10	39	3.9	1.53	3	2			57	0			7		6.68	
Hidden Valley Creek	122	258	2.14	2.65	238	226			124	74						
Lake Husted	2	8	4	0.87					7	0					10.57	
Lawn Lake	5	13	2.6	0.53					7	0					5.85	
The Loch	1	4	4	0.5					2	0					13	
Loomis Lake	1	4	4	4					16	0					8.12	
Lost Lake	2	4	2	0.25			1	0						10		
Mirror Lake	6	25	4.16	1.32	10	0			27	0	2	0	9.37		8.66	10
North Fork Big Thompson River	12	26	2.16	2.5	56	0	1	0	35	0	2	0	7.69	5	7.05	7.5
North St. Vrain Creek	2	3	1.5	2.33					7	0					8.42	
Peacock Pool	2	4	2	5.25					21	0					9.28	
Rock Lake	2	4	2	0.75	3	0							10			
Sprague Creek	3	6	2	1					6	0					8.3	
Spruce Lake	2	3	1.5	0.33			1	0						10		
Thunder Lake	2	3	1.5	1	6	0							10			
Ypsilon Lake	3	9	3	0												
TOTALS	232	473.25			323	230	3	0	373	78	8	2				
AVERAGES			2.03	1.49									8.22	8.33	7.54	9

* Number of fish released not recorded in 1984, and not comparable to following years.

nd = no data collected

Table 17.

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1984

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)*								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River	6	14	2.33	2.35	1	0	26	0	6	0	1	0	UNK	10.76	10.5	13
Haynach Lake	1	2	2	0.5	1	0							11			
Lone Pine Lake	3	9	3	2.77					25	0					7	
Lake Nanita	1	4	4	1	4	0							12.5			
Timber Creek	1	3	3	1.33					4	0					9.5	
Tonahutu Creek	2	2	1	5.5	8	0			3	0			10		7	
Verna Lake	9	35	3.88	1.77			2	0	38	0				7	7	
TOTALS	23	69			14	0	28	0	76	0	1	0				
AVERAGES			3	1.72									10.85	10.49	7.41	13

* Number of fish released not recorded in 1984, and not comparable to following years.

Table 18.

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1985

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	32	123.75	3.86	1.67	34	16	5	0	168	138	31	15	8.64	9.4	6.2	8.83
Cony Creek	3	12	4	2.91	35	25							9.17			
Fall River	17	20.75	1.22	1.1					23	16					6.39	
Fan Lake	338	473.25	1.4	1.72	8	6	6	6	802	559	5	3	7.13	6	7.58	7.2
Glacier Creek	5	40	8	0.9	3	0	3	0	30	0	2	0	9	7.66	6.16	10
Glass Lake	1	6	6	0.83	2	0			3	0			13		7.66	
Hidden Valley Creek	42	124.5	2.96	3.01	208	195			167	75			8.08		7.57	
Upper Hutcheson Lake	2	2	1	2	4	3							9.5			
Icy Brook	2	4	2	6	1	0			23	0			7		7	
The Loch	1	1.5	1.5	2	3	0							11.66			
Loomis Lake	2	10	5	5.7					57	53					9.1	
Mill Creek	1	2	2	1					2	0					7	
Mills Lake	3	12	4	0.66					8	0					8.87	
Pear Lake	10	54	5.4	1.27	50	30	19	14					8.4	7.52		
Sky Pond	7	14	2	0.14			2	0						17		
Sprague Creek	20	52	2.6	0.65	1	0	6	0	27	6	1	0	5	6	7.25	5
Spruce Lake	3	4	1.33	2			4	0	4	0				10.75	10	
North St. Vrain Creek	24	122.5	5.1	1.68	47	46	11	10	149	114	18	17	8.19	8.27	7.89	9.72
Thunder Lake	6	11	1.83	0.63	7	3							10.28			
TOTALS	519	1089.25			403	324	56	30	1463	961	57	35				
AVERAGES			2.09	1.81									8.36	8.09	7.46	8.94

1350 FISH RELEASED/ 1979 FISH CAUGHT = 68.22% RELEASED

Table 19

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1986

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	72	133	1.84	1.21	19	16	9	6	133	106			8.52	8.22	6.81	
Box Lake	2	3	1.5	2					6	6					7.67	
Cony Creek	9	26	2.88	4.07	76	44	4	3	25	17	1	0	7.16	6	7.84	6
Cub Lake	5	3	0.6	2.33					7	3					7.7	
Dream Lake	1	1.5	1.5	0												
Fall River	8	13	1.62	0.23					3	1					8	
Fan Lake	45	93	2.07	1.44	1	0	6	0	128	70			9	6	7.52	
Fern Lake	47	63	1.35	2.44	154	154							7.27			
Glacier Creek	13	47	3.57	2	8	6			86	77	6	4	8		6.75	7.33
Hidden Valley Creek	104	311	2.12	2.14	234	213	1	1	232	125			9.2	4	8.26	
The Loch	6	5	0.83	0												
Lion Creek	1	3	3	0												
Mill Creek	6	6.5	1.08	0.92			3	3	3	3				9	6	
North St. Vrain Creek	17	63	3.67	1.2	24	16			60	43	5	3	8.4		7.11	10
Ouzel Lake	12	28	2.34	3.1	88	88							6.88			
Pear Lake	2	11	5.5	3.18	17	16			18	18			10.17		8.55	
Sandbeach Lake	2	3	1.5	0												
Sprague Lake	159	179	1.12	0.94	1	0	1	1	167	82	1	0	6	6	5.65	6
Spruce Lake	18	36	2	0.41	1	1	14	6					11	9.35		
Thunder Lake	9	15	1.66	0.4	6	1							11			
Ypsilon Creek/Lake	2	10	5	1.5	4	2			9	2			9		9	
TOTALS	540	1053			633	557	38	20	877	553	13	7				
AVERAGES			1.95	1.48									8.13	7.94	7.19	8.15

1137 FISH RELEASED/ 1561 FISH CAUGHT = 72.84% RELEASED

Table 20

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1986

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River	3	10	3.33	2.8					28	17					7.17	
TOTALS	3	10			0	0	0	0	28	17	0	0				
AVERAGES			3.33	2.8											7.17	

17 FISH RELEASED/ 28 FISH CAUGHT = 60.71% RELEASED

Table 21

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1987

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	143	272	1.9	1.15	50	38	9	4	204	122	49	38	9.3	8.55	7.24	9.34
Black Lake	2	6	3	1.33					8	0					8.5	
Box Lake	3	2.75	0.92	5.09					14	14					7.28	
Chapin Creek	3	4	1.33	2.25					9	5					7.88	
Dream Lake	2	3	1.5	0.33	1	0					1	0	13			13
Fan Lake	134	207.5	1.55	1.88	25	25	9	5	356	200			9	7.66	7.48	
Fern Lake	10	13.5	1.35	5.48	74	74							8.24			
Glacier Creek	16	21.25	1.33	4.89	18	15	12	11	57	57	17	14	9.66	7.5	7.21	9.7
Lake Haiyaha	1	0.5	0.5	0												
Hidden Valley Creek	76	213.1	3.14	1	101	101			113	89			8.42		8.1	
Upper Hutcheson Lake	3	22	7.33	5.18	108	108	6	6					10	10		
Icy Brook	5	7	1.4	0.71	3	1	1	0	1	0			9	11	11	
The Loch	1	2	2	0.5	1	1							11			
Loomis Lake	4	6.5	1.62	1.23					8	8					7.75	
Mill Creek	7	10.75	1.54	2.22	6	1	1	0	14	9	4	1	9.66	9	8.07	10
North St. Vrain Creek	5	9	1.8	1.44	8	7	1	1	2	2	2	1	9.25	9	7	10
Odessa Lake	1	1	1	3	3	3							13			
Ouzel Creek	3	19	3.33	1.4	14	14							10.57			
Peacock Pool	6	22.5	3.75	1.29					29	8					8.44	
Sky Pond	6	21	3.5	1.48					31	15					8.74	
Sprague Lake	137	169.25	1.24	0.92	17	8	1	0	138	74	1	1	8.05	7	7.75	7
Spruce Lake	9	18.5	2.06	1.62	2	1	27	26	1	0			10	11	9	
Thunder Lake	7	6	0.86	0.83	5	2							12.6			
Wind River	3	5	1.67	0.8					4	0					6	
Ypsilon Lake	12	26	2.17	1.46	37	31	1	1					9.7	9		
TOTALS	599	1089.1			473	430	68	54	989	603	74	55				
AVERAGES			1.81	1.47									9.2	9.38	7.6	9.49

1142 FISH RELEASED/ 1604 FISH CAUGHT = 71.20% RELEASED

Table 22

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1988

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	85	127.3	1.5	1.5	2	2	16	13	139	119	36	32		6	6.3	7.3
Black Lake	2	2	1	2.5					5	0					9	
Boulder Brook	5	2	0.4	0												
Box Lake	2	1	0.5	9					9	4					7.7	
Cony Creek	2	2	1	2	4	4							9			
Cow Creek	5	8	1.6	2.1					17	12					6	
Fall River	3	7	2.3	2					14	13					8.8	
Fan Lake	81	139.8	1.7	2.1	9	9	1	1	263	212	16	11	8	6	6.5	8
Fern Lake	8	14.5	1.8	4.4	64	64							8.8			
Lawn Lake	12	8.5	0.7	3.2	27	27							8.5			
Glacier Creek	3	13	2.6	2.8					35	34	2	2			6.6	9
Hague Creek	5	20	4	0.4	1	1			5	2	2	2			6.5	11
Hidden Valley	52	114	2.6	1	35	35			74	43					8.5	
Loomis Lake	1	0.5	0.5	6	3	1										
Mills Lake	4	3	0.75	0												
North St. Vrain Creek	14	35	2.5	1.2	1	1			40	36	11	11	11		5.2	6
Ouzel Creek	3	36	10.3	2.6	94	94							9.4			
Poudre Lake	6	6	1	0.7					4	0					8	
Sheep Lake	4	2	0.5	0												
Sky Pond	2	2	1	2.5					5	0					9	
Sprague Lake	67	124	1.9	1.9	1	1	1	1	122	98	2	2	9	9	7.3	6
Spruce Lake	8	7.5	0.9	2.5			19	10						10.1		
The Loch	5	10	2	0.3	3	3							11			
Thunder Lake	20	57.5	2.8	0.5	21	4	1	1	8	1			5.9	9	9.1	
Upper Hutcheson	2	25	12.5	1.8	45	45							10.4			
Ypsilon Lake	4	6.5	1.6	1.2	8	8							8.3			
TOTALS	405	774.1			318	299	38	26	740	574	69	60				
AVERAGES			1.91	1.5									7.85	8.21	6.85	7.37

959 FISH RELEASED/ 1165 FISH CAUGHT = 82.32% RELEASED

Table 23

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1988

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River	54	133.5	2.8	2.5	27	27	2	2	270	247	23	19	6.5	6	6.1	8.9
East Inlet	9	39	7.8	4.7	3	3			180	162			9		6.5	
Grand Ditch	2	2.7	1.4	2.2	4	3					2	1	6.5			9
North Inlet	6	15.5	2.6	1.8					28	9	3	3			6.6	8.7
Onahu Creek	8	30.5	3.8	3.9	14	10			94	50	11	11	6		6.4	7.5
Timber Lake	3	2	0.7	0.5	1	1							11			
Tonahutu Creek	12	49	4.1	8.1					399	345					5.4	
TOTALS	94	272.2			49	44	2	2	971	813	39	34				
AVERAGES			2.89	3.89									6.6	6	5.93	8.49

893 FISH RELEASED/ 1061 FISH CAUGHT = 84.17% RELEASED

Table 24

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1989

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	24	65.5	2.7	2.4	11	11	10	8	95	75	42	42	6.84	7.2	6.8	9.1
Boulder Brook	3	4	1.3	0.75					3	0					6	
Box Lake	2	4	2	5					20	16					6.15	
Cascade Creek	2	3	1.5	3.3					6	4					7.5	
Chapin Creek	4	7	1.75	5.86					41	31					8.93	
Cow Creek	1	1	1	5					5	1					9	
Fall River	12	15.5	1.3	7.35	1	1			113	58			6		6.6	
Fan Lake	66	123.2	1.9	3	26	22	3	3	335	264	6	5	7.04	9	6.9	9
Fern Creek	1	0.5	0.5	4	2	2							9			
Fern Lake	7	7	1	6	42	42							7.7			
Glacier Creek	9	23	2.6	1.95	2	2	9	1	26	25	8	8	9	6.3	6.6	7.5
Hague Creek	7	16.5	2.4	1.56					25	16					7.2	
Hidden Valley Creek	14	33	2.4	6.42	154	154			58	58			6.6		6.8	
Icy Brook	8	15	1.88	1.93					29	19					9.96	
Little Rock Lake	1	2	2	10	20	20							6.6			
Lawn Lake	18	15	0.8	6	90	82							7.5			
Loomis Lake	1	1.5	1.5	3.33					5	1					8	
Mill Creek	4	0.5	0.1	0												
Mirror Lake	5	4.5	0.9	3.1	1	1			12	5	1	1	9		7.8	12
North St. Vrain Creek	7	7	1	0.28	1	1			1	1			6		6	
Poudre Lake	4	3	0.75	10.7					32	26					6.6	
Poudre River	9	22.75	2.5	4.3	1	1			97	64			6		7	
Peacock Pool	6	34	5.7	1.1					38	10						
Sprague Lake	51	74.25	1.5	0.86			9	9	55	36				6.6	6.7	
Spruce Lake	1	2	2	2			4	4						12		
Thunder Lake	6	19	3.2	2	15	10			23	23			9		5.5	
Ypsilon Lake	7	21	3	0.66	10	10			4	0			10.2		12	
TOTALS	280	524.7			376	359	35	25	1023	733	57	56				
AVERAGES			1.87	2.84									7.19	7.51	7.01	8.91

1173 FISH RELEASED/ 1491 FISH CAUGHT = 78.67% RELEASED

Table 25

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1989

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River, Upper	119	219.6	1.84	1.57	10	10	57	38	218	164	60	45	6	8.6	6.4	7.4
Colorado River, Lower	5	8	1.6	2			16	0						9		
Columbine Creek	1	1.8	1.8	3.3			6	6						6		
East Inlet	13	41	3.15	2.46					101	76					6.2	
Haynach Lake	3	3	1	2	6	2							11.5			
Lone Pine Lake	2	2	1	0												
Lake Nanita	8	16	2	2.5	40	27							11.7			
North Inlet	15	21	1.4	2.61	16	12			37	35	2	2	6.7		8.4	6
Onahu Creek	24	52	2.16	3.11			10	10	152	103				9.6	6.4	
Pettengell Lake	1	1	1	12	12	10							10			
Timber Lake	1	6	6	0.33	2	2							13			
Timber Creek	1	3.5	3.5	6.57	23	23							6.3			
Tonahutu Creek	13	29	2.2	1.72	1	1			49	37			6		6.6	
TOTALS	206	403.9			110	87	89	54	557	415	62	47				
AVERAGES			1.96	2.02									9.1	8.6	6.51	7.35

603 FISH RELEASED/ 818 FISH CAUGHT = 73.72% RELEASED

Table 26

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1990

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	19	43.3	2.2	3.8	96	95	1	1	60	59	17	17	6.42	11	5.8	8.8
Fall River	1.8	27.3	1.5	3.8	6	6	1	1	89	79	7	7	7	6	6.4	7.7
Fan Lake	5.3	75.1	1.4	2.4	1	1	15	15	157	154	7	6	7.4	5.1	6.1	8.1
Fern Lake	1	1	1	6	6	6							8			
Glacier Creek	10	12	1.2	2			2	2	5	5	17	17		7.5	7.2	6.7
Hague Creek	5	14.5	2.9	2.4	1	1			34	30			9		9.3	
Hidden Valley Creek	67	189	2.8	2.1	157	157			238	209			8.1		7.6	
Lawn Lake	15	15	1	1.9	29	29							6.2			
Lily Lake	4	6	1.5	0.8			5	5						18.7		
Lost Lake	4	6.5	1.6	4.2	27	27							9			
Loomis Lake	1	2	2	0.5			1	1						9		
Mill Creek	1	3	3	5.7					17	17					6	
Mills Lake	4	18	4.5	0.7			12	8						7		
Mirror Lake	6	10	1.6	4.4	11	11			33	27			7.8		7.4	
North St. Vrain Creek	9	30	3.3	1.6	2	2	2	2	41	29	4	4	8	9	7.1	8
Ouzel Creek	9	27	3	1.9	45	45			7	7			6.2		6.8	
Poudre Lake	11	9.7	0.9	1.4			3	3	11	11				8	7	
Poudre River	21	37.5	1.8	7.2					271	210					6.1	
Sprague Lake	26	33	1.2	1.36			4	4	36	31	5	3		8.5	6.8	7.2
Thunder Lake	2	5	2.5	0.4					2	2					7	
TOTALS	222.1	564.9			381	380	46	42	1001	870	57	54				
AVERAGES			2.54	2.62									7.34	8.06	6.7	7.75

1346 FISH RELEASED/ 1485 FISH CAUGHT = 90.64% RELEASED

Table 27

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1990

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River, Upper	135	268	1.99	1.25	2	1	83	41	219	191	32	17	12	10.5	12	9.9
Colorado River, Lower	64	182	2.84	0.38	2	0			57	37	9	7	12		12	9.9
Lake Nanita	45	155	3.44	1.12	174	116							10.9			
TOTALS	244	605			178	117	83	41	276	228	41	24				
AVERAGES			2.47	0.95									10.92	10.5	12	9.9

410 FISH RELEASED/ 578 FISH CAUGHT = 70.93% RELEASED

Table 28

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1991

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	6	16.3	2.7	2.1	4	4			31	31	1	1	7.5		6.9	9
Box Lake	2	3.5	1.8	2.3					8	3					6	
Cony Creek	1	4	0.75	15	60	60							9.2			
Fall River	6	11	1.8	0.73	2	2			3	3	3	3	9		6.8	9
Fan Lake	67	75.5	1.1	3.2	7	7			228	217	9	9	6		6.1	8.7
Hague Creek	4	26	6.5	1.7	2	2			42	36			9		6.7	
Hidden Valley Creek	50	92.4	1.8	4.1	163	163			218	173			7.9		7.4	
Lily Lake	9	14	1.6	0.6			9	9						12		
North Fork Big Thompson River	2	2	1	3.5	1	1			6	0			9		6.5	
North St. Vrain Creek	7	12.5	1.8	4.9					39	38	24	24			7.5	8.7
Pear Lake	1	1	1	4	4	4							9			
Poudre River	10	13	1.3	2.8	1	1			29	22	6	0	12		6.9	12
Sprague Lake	17	37	2.2	3.9					143	107					7.4	
The Loch	1	4	4	2			2	0	6	6				12	6	
Thunder Lake	11	49	4.5	0.8	26	24			15	13			11.3		9	
TOTALS	194	361.2			270	268	11	9	768	649	43	37				
AVERAGES			1.86	3.02									8.47	12	6.88	9.18

963 FISH RELEASED/ 1092 FISH CAUGHT = 88.19% RELEASED

Table 29

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1991

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River, Upper	81	133.6	1.75	1.93	17	14	23	21	190	161	28	27	8.1	10.9	6.6	7.3
Colorado River, Lower	22	63	2.96	1.94	22	22	76	73	3	3	21	20	11	11.3	9	11.8
East Inlet	28	52.9	1.98	5	1	1			264	212			6		6.4	
Fourth Lake	3	4	1.33	25					100	100					5	
Haynach Lake	4	5.5	1.4	1.3	7	7							11.3			
Lone Pine Lake	8	11.8	1.5	3.6					42	42					6.6	
Lake Nanita	28	56.3	2	2.97	50	44			117	106			11.3		11.4	
North Inlet	30	34.8	1.2	3.6	10	10			112	86	2	0	8.7		6.8	12
Onahu Creek	4	11.5	2.9	2.7					31	29					6.7	
Pettingell Lake	1	0.2	0.2	15	3	3							12			
Lake Solitude	1	1.5	1.5	5.3	8	8							7.8			
Ten Lakes Park	1	0.5	0.5	2	1	1							6			
Timber Lake	1	0.5	0.5	0												
Tonahutu Creek	13	22.5	1.7	2.71			1	1	59	59	1	1		6	6.5	6
Verna Lake	13	31.5	2.4	8.8			1	1	277	246				6	6.4	
TOTALS	238	430.1			119	110	101	96	1195	1044	52	48				
AVERAGES			1.8	3.41									10.26	11.1	6.86	9.27

1298 FISH RELEASED/ 1467 FISH CAUGHT = 88.48% RELEASED

Table 30

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1992

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	20	42	2.1	5.4	69	69	6	6	86	80	69	69	8.3	9	7.7	9.3
Cony Creek	30	4	0.1	7.5	10	10			20	20			7		9	
Cow Creek	6	3	0.5	3.3			1	1	8	8	1	1		9	7	9
Fall River	40	35	0.9	2.7	4	4			83	75	8	8	7		7	8.3
Fan Lake	59	77	1.3	2.3	8	8			147	115	24	24	8		7.1	7.5
Fern Lake	6	10	1.7	4.2	42	42							9.6			
Glacier Creek	2	3	1.5	6.7			1	1	3	3	16	16		9	7	9
Hidden Valley Creek	30	38	1.3	2.2	62	62			21	18	1	1	8.9		8	11
Lawn Lake	2	2	1	4	8	8							8			
Lily Lake	25	30	1.2	0.9	19	13	8	8					9.65	8.8		
Lost Lake	2	4	2	1	4	4							10			
Mill Creek	1	2	2	2					2	0	2	2			7	7
Mills Lake	1	2	2	0												
Mirror Lake	7	13	1.9	8.1					106	82					7.7	
North St. Vrain Creek	2	2	1	4					5	5	3	1			9	9.8
Ouzel Lake	1	3	3	5	15	15							11			
Ouzel Creek	5	18	3.6	3.4	53	53			8	8					9.2	
Peacock Pool	4	6	1.5	0.8					5	2					11	
Pear Lake	30	5	0.2	6			12	12	18	18				7	9	
Poudre Lake	5	11	2.2	2.1					23	16					8	
Roaring River	3	5	1.7	15.6	78	78							9.3			
Thunder Lake	1	4	4	3.8	7	7	1	1	7	7			9.5	9	7	
Sprague Lake	15	27	1.8	1.4					37	36					7.3	
Ypsilon Lake	3	7	3.5	1.7	12	12							9.3			
TOTALS	300	353			391	385	29	29	579	493	124	122				
AVERAGES			1.17	3.18									9.01	8.11	7.24	8.83

1029 FISH RELEASED/ 1123 FISH CAUGHT = 91.63% RELEASED

Table 31

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1992

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River	74	95	1.3	2.8	1	1	34	27	186	163	43	36	12	10.5	7	9.8
East Inlet	49	75	1.5	6.8	16	16	2	2	490	465	1	1	9	7		7
Fourth Lake	5	3	0.6	8.3					25	25					7.5	
Haynach Lake	14	24	1.7	2.3	55	42							10.2			
Lake Nanita	12	24	2	5.6	135	127							9.9			
Lake Verna	18	31	1.7	5.1					155	108					8	
Lone Pine Lake	4	4	1	7.5					30	30			7.1		7.1	
North Inlet	17	21	1.2	2.4	8	8			42	36	1	1	9.5		7.6	11
Onahu Creek	3	3	1	2					5	2	1	1			7	9
Paradise Creek	2	2	1	4	8	8							8.2			
Pettingell Lake	2	4	2	5.5	22	22							11			
Timber Lake	2	4	2	3.8	15	15							11			
Tonahutu Creek	5	10	2	5.6			40	39	17	17				8.8	7	
TOTALS	207	300			260	239	76	68	950	846	46	39				
AVERAGES			1.44	4.44									10	9.51	7.42	9.74

1192 FISH RELEASED/ 1332 FISH CAUGHT = 89.49% RELEASED

Table 32

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1993

WATER	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	42	97.05	2.31	1.03	3	3	33	27	29	27	35	31	8	8.63	7.24	9.51
Corral Creek	3	9	3	1.11					10	3					8.1	
Cow Creek	7	15	2.14	3.27			1	1	24	24	24	24		11.25	9.75	11.43
Fall River	47	45	0.96	2.51	30	30	2	2	69	56	12	12	7.2	6	6.17	8.25
Fan Lake	60	91.3	1.52	1.18	46	46	1	1	60	46	1	1	8.87	6	5.8	9
Finch Lake	1	6	6	0												
Glacier Creek	3	3	1	3.67	2	2	2	2	6	6	1	1	7.5	12	9	6
Hague Creek	1	1.3	1.3	8.46					11	11					7.63	
Hidden Valley Creek	13	8.1	0.62	2.96	13	13			11	1			9		7.9	
Hutcheson Lakes	5	30.3	6.06	5.21	158	158							8.92			
Lily Lake	46	107.1	2.33	1.7	182	182							11.55			
Glass Lake	1	1	1	1					1	1					9	
The Loch	1	0.05	0.05	0												
Peacock Pool	2	5	2.5	4.8					24	18					9	
Poudre Lake	6	4.45	0.74	7.87	2	2			33	27			9		7.54	
Roaring River	6	12.3	2.05	10	76	76			45	35	2	2	8.29		7.2	9
Sandbeach Lake	7	16	2.29	0.25	4	4							12			
Sprague Lake	7	13.45	1.92	3.49			8	8	39	39				6.75	6.76	
North St. Vrain Creek	18	49.3	2.74	3.73	39	39	13	12	105	70	27	23	10	8	6.31	9.33
Thunder Lake	4	14	3.5	0.57			8	8						9.75		
TOTALS	280	528.7			555	555	68	61	467	364	102	94				
AVERAGES			1.88	2.25									9.47	8.44	6.76	9.71

1074 FISH RELEASED/ 1192 FISH CAUGHT = 90.10% RELEASED

Table 33

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1993

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Adams Lake	1	0.3	0.3	0												
Colorado River	95	111.25	1.17	2.47	1	1	134	104	102	82	38	35	8	9.71	7.7	8.92
Columbine Creek	6	16	2.67	1.13			3	0	15	15				9	6.2	
East Inlet	20	24.5	1.23	3.96					96	73	1	1			6.75	9
Green Mountain Creek	1	4	4	2.25			3	0	6	6				9	6	
Haynach Lake	2	3	1.5	0.67	2	1							12			
Lone Pine Lake	12	6.3	0.53	6.51	3	0			41	39			6		8.04	
Lake Nanita	9	29	3.22	1.52	44	39							8.65			
Lake Nakoni	2	1	0.5	2	2	2							7.5			
North Inlet	17	18.3	1.08	4.26	22	20			53	46	3	3	8.18		7.13	8.5
Onahu Creek	1	nd	-	-					3	3					9	
Spirit Lake	2	3	1.5	3.67					11	3					6.54	
Tonahutu Creek	17	27.7	1.63	2.49	3	3			66	49			10		6.72	
Lake Verna	12	14	1.17	6.57					92	66					7.33	
TOTALS	197	258.35			77	66	140	104	485	382	42	39				
AVERAGES			1.31	2.87									8.51	9.67	7.18	8.89

591 FISH RELEASED/ 744 FISH CAUGHT = 79.44% RELEASED

nd = no data recorded

Table 34

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1994

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	71	119.8	1.69	0.97	5	5	13	11	60	46	38	35	11	6.15	7.13	8.79
Fall River	20	13	0.65	3.31	4	4	3	3	36	32			11	6	5.81	
Fan Lake	21	27	1.29	1.93	6	6	2	2	42	38	2	2	9.6	5.5	6.5	5.5
Fern Lake	2	2	1	2	4	4							11			
Finch Lake	5	17	3.4	0.24	4	4							11			
Glacier Creek	8	8.5	1.06	4			6	6	18	17	10	9		7.67	8.72	8.9
Hague Creek	1	1.3	1.3	8.46					11	11					7.63	
Lake Haiyaha	3	3	1	1.67	5	5							12.4			
Hidden Valley Creek	26	52	2	1.48	12	12	1	0	61	24	3	2	9.67	11	7.25	9.67
Lawn Lake	7	12.5	1.79	0.72	7	7			2	2			11	5.5		
Lily Lake	29	53	1.83	1.23	65	65							10			
The Loch	19	26.5	1.39	3.02	59	59	1	0	17	10	3	2	9.69	11	5.76	9.67
Lost Lake	3	4	1.33	1.25	5	5							10			
Mills Lake	5	12	2.4	2.17	4	4	9	6	13	8			11	10.11	5.62	
Mirror Lake	4	8	2	3.63	4	4					25	20	11			7.76
North St. Vrain Creek	5	9	1.8	3.33	29	29			1	1			8.86	9		
Roaring River	24	48	2	3.19	129	129	1	0	20	13	3	2	7.85	11	5.8	9.67
Sky Pond	3	2.5	0.83	2	4	4			1	1			11		4	
Sprague Lake	22	24.5	1.11	1.63	4	4			35	24	1	0	11		9.29	9
Thunder Lake	13	47	3.62	0.26	9	8	1	1	2	0			11	18	11	
Willow Creek	8	8	1	10.25	21	21			61	58			10.5		9.25	
TOTALS	299	498.6			380	379	37	29	380	285	85	72				
AVERAGES			1.66	1.76									9.3	8.02	7.35	8.51

765 FISH RELEASED/ 882 FISH CAUGHT = 86.73% RELEASED

Table 35

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1994

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River, Upper	48	95	1.98	1.17	5	5	12	10	88	70	6	1	11	9.83	6.82	10
Colorado River, Lower	11	17	1.55	1.53	4	4	13	13			9	9	11	8.15		7.89
East Inlet	16	27	1.69	4.19	6	6			107	94			9.17		6.21	
Haynach Lake	5	17	3.4	2.59	44	42							11			
Lone Pine Lake	4	6.5	1.63	1.54					10	5					6.7	
Lake Nanita	11	6.5	0.59	2.77	18	18							11			
North Inlet	35	51.6	1.47	4.28	76	65	3	1	131	131	11	9	7.74	11	7.08	7.55
Onahu Creek	8	14	1.75	2.86	4	4			36	36			11		7.08	
Pettingell Lake	3	4	1.33	1.75	7	6							11.43			
Timber Creek	3	5	1.67	1	5	5							11			
Tonahutu Creek	20	28.5	1.43	3.12	50	50	1	0	35	18	3	2	9.46	11	5.91	9.67
TOTALS	164	272.1			219	205	29	24	407	354	29	21				
AVERAGES			1.65	2.51									9.48	9.23	6.68	8.38

604 FISH RELEASED/ 684 FISH CAUGHT = 88.30% RELEASED

Table 36

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1995

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	38	86.75	2.28	0.59	1	0	2	2	31	23	17	17	7	7	5.94	7.47
Cony Creek	2	16	8	1.88	30	30							5.5			
Crystal Lake	1	5	5	1	5	5							9.4			
Fall River	2	11.5	5.75	0.09							1	0				11
Fan Lake	18	43	2.39	0.47	1	1			10	2	9	5	9		8	5.33
Glacier Creek	4	5.5	1.38	3.82					21	3					5.57	
Hidden Valley Creek	108	60.35	0.56	1.62	39	38			59	56			8		6.14	
Lily Lake	77	113.12	1.47	1.09	123	123							12.87			
Lower Hutcheson Lake	2	2	1	2	4	4							11			
Middle Hutcheson Lake	4	5	1.25	5.8	29	29							10.03			
Mills Lake	2	3.5	1.75	4.57					16	6					5.5	
Mirror Lake	2	1	0.5	3			3	3						9		
Mummy Pass Creek	3	3	1	11.33					34	30					6.24	
North St. Vrain Creek	2	6	3	0.33			1	1			1	1		7		9
Ouzel Lake	2	7	3.5	3.29	8	8			15	15			10		7.07	
Pear Lake	3	13	4.33	3.46	45	45							7.84			
Roaring River	5	7	1.4	0.57	2	2	1	1	1	1			9	9	4	
Sky Pond	2	5	2.5	3					15	11					7.93	
Sprague Lake	21	30.5	1.45	1.11	2	2			32	27			8		7.56	
Thunder Lake	4	11	2.75	3.36	37	36							13.38			
Upper Hutcheson Lake	2	18	9	7.56	136	136							8.99			
TOTALS	304	453.22			462	459	7	7	234	174	28	23				
AVERAGES			1.49	1.61									10.04	8.14	6.47	6.57

663 FISH RELEASED/ 731 FISH CAUGHT = 90.70% RELEASED

Table 37

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1995

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River, Upper	38	81.5	2.14	1.12	1	1	36	33	50	50	4	1	11	8.86	6.62	10.5
Colorado River, Lower	6	11	1.83	1.45			16	0						10.13		
East Inlet	6	12	2	2.42			3	3	26	26				9	6.85	
Lone Pine Lake	19	28	1.47	0.32					9	8					6.11	
Lake Nanita	3	2	0.67	2.5	5	3							11			
North Inlet	5	12	2.4	2.33	3	1			25	20			10.33		6.8	
Onahu Creek	3	5	1.67	8					40	38					5.68	
Tonahutu Creek	20	36	1.8	1.11					40	40					6.53	
Lake Verna	6	21	3.5	5.81					122	111					7.13	
TOTALS	106	208.5			9	5	55	36	312	293	4	1				
AVERAGES			1.96	1.82									10.77	6.29	6.7	10.5

335 FISH RELEASED/ 380 FISH CAUGHT = 88.16% RELEASED

Table 38

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1996

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	26	60	2	2.6	1	1	3	3	94	77	58	56	7	8.33	7.45	8.65
Cow Creek	5	10	2	1.5					12	11	3	3			7	9
Crystal Lake	1	1	1	1	1	1							15			
Fan Lake	15	35	2.18	1.17	1	1	3	3	37	37	2	2	4	7	5.64	4
Fay Lakes	1	4	4	4.5	18	18							7.88			
Fern Lake	5	9.8	1.9	6.1	83	83							10.13			
Hague Creek	1	2	2	5.5					11	9					8.09	
Hidden Valley Creek	2	4.5	2.25	0.66					3	3					5	
Lake of Glass	1	4	4	2	7	7			1	1			7		7	
Lawn Lake	3	8	2.66	4.37	33	33					2	2	12.33			10
Lily Lake	51	183.5	2.95	0.64	118	118							13.23			
Loch Vale	4	8	2	2.12	17	17							11.47			
Mills Lake	3	7.5	2.5	0.93			6	6			1	1		8.33		13
North Fork Big Thompson River, Lower	3	2.5	0.83	6					15	11					7.53	
North Fork Big Thompson River, Upper	2	5	2.5	3	13	13			2	2			7		7	
North Fork Big Thompson River, Lake Louise Basin	1	4	4	4	16	16							9			
North St. Vrain Creek	1	2.5	2.5	0.8					1	1	1	1			9	9
Poudre River	1	4	4	3.5					14	12					8.14	
Roaring River	6	10	1.66	3	30	30							9.2			
Sandbeach Lake	1	0.5	0.5	0												
Sprague Lake	11	7.75	0.7	0.77					6	4					7.66	
Spruce Lake	1	2.5	2.5	6	15	15							8.86			
Thunder Lake	2	nd	-	-	16	16			2	2			9.5		11	
Ypsilon Lake	2	4.5	2.25	0.22					1	1					13	
TOTALS	149	380.55			369	369	12	12	199	171	67	65				
AVERAGES			2.3	1.7									10.88	8	7.21	8.64

617 FISH RELEASED/ 647 FISH CAUGHT = 95.36% RELEASED

nd = no data collected

Table 39

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1996

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Haynach Creek	1	0.5	0.5	24	12	11							13.33			
North Inlet	1	0.5	0.5	26	13	12							11.46			
TOTALS	2	1			25	23										
AVERAGES			0.5	25									12.36			

23 FISH RELEASED/ 25 FISH CAUGHT = 92.00% RELEASED

Table 40

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1997

WATER	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Arrowhead Lake	2	10	3.33	0.6	6	6							9			
Big Thompson River	3	12	4	5.25					46	46	17	17			6.47	8.64
Cony Creek	3	6	1	4.66	28	28							8.92			
Cow Creek	2	4	2	2.5			2	2	6	6	2	2		7	7	9
Glacier Creek	4	2.53	0.63	1.97	2	2			3	3			10		9	
Hidden Valley Creek	7	15	2.14	3.06	4	4			42	36			12		7.95	
Lily Lake	150	473.75	2.94	0.8	382	382							13.24			
Lower Hutcheson Lake	2	6	1.5	0.5	3	3							11			
North Fork Big Thompson River, Lower	3	6	1.5	5.33					17	17	15	15			5.7	4
North St. Vrain Creek	4	9	2.25	4	16	16			14	14	6	6	9.87		9	13.66
Ouzel Creek	4	12	3	1	7	7	1	1	4	4			8.42	9	8	
Pear Lake	1				1	1							7			
Sprague Lake	22	19.5	1.18	1.38	1	1			26	16			7		8.92	
TOTALS	207	575.78			450	450	3	3	158	142	40	40				
AVERAGES			2.55	1.13									12.65	7.67	7.51	7.67

635 FISH RELEASED/ 651 FISH CAUGHT = 97.54% RELEASED

Table 41

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1997

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River, Lower	2	6	3	0.83	1	1	4	4					11	11		
Colorado River, Upper	8	53	10.5	0.58			3	3	24	24	4	4		8.33	6.25	8.25
Lake Nanita	3	8	2.66	0.75	6	1							11			
Lone Pine Lake	2	8	4	0.12					1	1					7	
North Inlet	1	2	2	6.5	1	1			12	12			11		4	
Timber Creek	1	1	1	0												
Tonahutu Creek	4	9	2.25	2.33					21	12					9.22	
TOTALS	21	87			8	3	7	7	58	49	4	4				
AVERAGES			3.7	0.88									11	9.86	6.87	8.25
					63	FISH RELEASED/			77	FISH CAUGHT			=	81.82%	RELEASED	

Table 42

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1998

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Big Thompson River	18	63	2.42	1.66	2	2	6	6	54	54	43	43	11	7.33	6.72	7.16
Boulder Brook	1	1	1	2							2	2				11
Cony Creek	1	0.5	0.5	12	6	6							6.33			
Cow Creek	1	4.5	4.5	0.44					2	2					5.5	
Crystal Lake	4	8.5	2.12	1.05	9	9							17			
Fall River	4	20	2.22	1.3	7	7	4	4	9	5	6	3	6.14	7	5	9
Fan Lake	5	6.25	1.25	0.8			2	0	3	3				4	7	
Fern Lake	10	34.75	3.15	2.33	81	81							9.38			
Glacier Creek	9	33.5	3.04	0.74	1	1	2	2	18	17	4	4	7	8	6.88	6.75
Hidden Valley Creek	1	2.5	2.5	1.6					4	4					6.25	
Lake Husted	1	1	1	21	21	21							10.71			
Icy Brook	1	3	3	3.66					10	10	1	1			6.4	9
Lawn Lake	9	36.5	3.04	1.28	46	46	1	1					9.56	9		
Lily Lake	80	243.83	2.97	0.54	134	134							12.88			
The Loch	1	6	6	3	18	18							11.33			
Loomis Lake & Pond	1	2	2	19	38	38							11			
Middle Hutcheson Lake	2	5	1.25	1	5	5							10.6			
Mills Lake	3	11	3.66	1.36	1	1	4	3	10	10			4	9.5	4.7	
North Fork Big Thompson River, Lower	1	3	3	1	2	2	1	1					9	9		
North St. Vrain Creek	3	8	2.66	1.5	2	2			3	3	7	7	8		6	9.28
Odessa Lake	1	2	2	2.5	5	5							9.8			
Ouzel Lake & Creek	5	23	4.6	1.34	15	15			16	3			9.66		7.68	
Peacock Pool	4	16	4	2.12					34	34					6.58	
Pear Lake	4	10.5	1.75	3.61	38	38							8.34			
Poudre River	2	4.5	2.25	5.77					26	16					6.96	
Roaring River	31	112.75	3.31	4.07	459	459							8.99			
Sandbeach Lake	1	6	6	1	6	6							11.5			
Sprague Lake	28	77.75	2.42	1.02			1	1	78	78	1	1		7	7.32	7
Spruce Lake	14	43.25	3.08	3.37	140	140							8.18			
Thunder Lake	1	12	6	0												
Upper Hutcheson Lake	2	30	5	4.53	136	136							9.05			
Ypsilon Lake	4	9.5	2.37	1.15	11	11							11.9			
TOTALS	253	841.08			1183	1183	21	18	267	239	64	61				
AVERAGES			2.9	1.82									9.59	7.57	6.8	7.69

1501 FISH RELEASED/ 1535 FISH CAUGHT = 97.79% RELEASED

Table 43

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1998

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
			AVG.		CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Colorado River, Upper	8	29	2.37	1.96					54	54	3	3			5.12	8
East Inlet	1	3	3	0.33					1	0					4	
North Inlet	1	4	2	0												
TOTALS	10	36							55	54	3	3				
AVERAGES			2.4	1.61											5.1	8

57 FISH RELEASED/ 58 FISH CAUGHT = 98.28% RELEASED

Table 44

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, EAST SIDE, 1999

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Arrowhead Lake	1	3	3	1.66	5	5							13			
Big Thompson River-Moraine Park	23	94.5	2.55	1.67	2	2	12	6	123	123	21	21	9.5	7.58	6.83	8
Big Thompson River-Forest Canyon	4	10.5	2.62	5.9	62	62							8.12			
Black Canyon Creek	1	1.25	1.25	3.2					4	4					10	
Black Lake	1	2	2	1					2	2					10	
Box Lake	2	4	2	10.25					41	35					6.56	
Cache la Poudre River	3	4.5	1.5	0												
Caddis Lake	4	8	2	1.62	13	13							9.92			
Chapin Creek	1	1	1	22					22	18					7	
Copeland Lake	1	2	2	2.5					5	2					8	
Cow Creek	3	3	1	5					3	3	12	12			7	9.33
Dream Lake	2	2	1	2.5	5	5							14.6			
Fall River	5	13.5	2.7	1.85	2	2			8	7	15	15	5.5		7.12	7.13
Fan Lake	6	21	3	1.47	11	11	1	1	19	19			6.81	4	6.84	
Fern Lake	2	20	4	0.2	4	4							7			
Glacier Creek- Below Alberta Falls	3	11.5	3.83	0.86			1	1	5	5	4	4		9	6.8	8.5
Glacier Creek- Above Alberta Falls	8	20	2.5	4	29	29	19	19	32	28			7.41	11	8.53	
Gorge Lakes Stream	4	4.25	1.06	4.47	19	19							7.26			
Hague Creek	3	2.75	0.91	16	1	1			43	36			11		7.46	
Lake Haiyaha	1	2.5	2.5	2	5	5							13			
Hidden Valley Creek	3	6	1.5	1.5	1	1			8	8			4		7	
Lake Husted	1	0.75	0.75	6.66	5	5							9.4			
Icy Brook	3	28	4.66	1.17	13	13			20	20			10.15		10	
Lawn Lake	5	17.5	2.91	0.74	13	13							10.84			
Lily Lake	177	477.75	2.38	0.67	319	319	5	5					11.81	13		
Lion Lakes Stream	2	5.5	2.75	7.63					42	42					6.92	
Little Rock Lake	3	3.5	1.16	0.28	1	1							11			
The Loch	3	10	3.33	1.9	11	7	8	8					11.54	20.5		
Loomis Lake	1	0.25	0.25	12	3	3							5			
Lost Lake	2	4	2	0												
Lake Louise	1	0.5	0.5	12	6	6							11.66			
Mill Creek	1	3	3	0.66					2	2					4	
Mills Lake	2	5	2.5	1.2			6	6						10.66		
North Fork Big Thompson River-Lower	1	nd	nd	nd	3	3							7			
North St. Vrain Creek	3	10	3.33	0.4					1	1	3	0			7	11
Odessa Lake	1	8	4	1	8	8							8.25			
Ouzel Lake	5	13	2.6	0.84	11	11							9			
Poudre Lake	1	12	3	1.08					13	13					7.46	
Primrose Lake	1	1.08	1.08	7.4	8	8							8.5			
Roaring River	14	35	2.5	1.42	48	48	1	1	1	1			9.1	7	4	
Sandbeach Lake	4	5.5	1.37	0.18	1	1							11			
Sandbeach Creek	3	8.25	2.75	4.96	41	41							6.92			
Sky Pond	1	2	2	3.5					7	4					11	
Sprague Lake	1	2	2	0.5							1	1				7
Spruce Lake	3	14.5	4.83	5.79	84	84							9			
Thunder Lake	2	7	1.75	0.42	1	1	2	2					13	7		
Willow Creek	1	2	2	9.5					18	18					6.05	
Ypsilon Lake	1	4	4	0												
Ypsilon Creek	4	4.46	1.11	4.26	19	19							8.15			
TOTALS	328	921.79			754	750	55	49	419	391	56	53				
AVERAGES			2.45	1.39									10.02	11.39	7.27	8.23

1243 FISH RELEASED/ 1284 FISH CAUGHT = 96.81% RELEASED

nd = no data

Table 45

ROCKY MOUNTAIN NATIONAL PARK CREEL SURVEY, WEST SIDE, 1999

	ANGLER				FISH											
					SPECIES CAUGHT(C) AND RELEASED(R)								LENGTH IN INCHES			
					CUT		RBT		BKT		BNT					
WATER	# ANG	HOURS	AVG. HRS/DAY	FISH/HR	C	R	C	R	C	R	C	R	CUT	RBT	BKT	BNT
Baker Creek	3	15	2.83	5.33					74	74	6	6			8.62	8
Colorado River-Upper	13	76	3.03	3.09	3	3			204	199	28	27	7.33		5.77	9.07
East Inlet	1	2	2	3.5					7	7					6.85	
Fourth Lake	3	2.5	0.83	5.6					14	5					7.71	
Haynach Lakes	4	7	1.75	1.85	13	13							9.61			
Haynach Lakes Stream	2	5	2.5	4.4	22	22							9			
Lake Nanita	13	92.5	3.87	3.35	310	291							13.01			
North Inlet-Lower	5	13	1.8	1.15					8	8	7	7			8	8.42
North Inlet-Upper	6	14	2.5	3.21	45	45							10.15			
Onahu Creek-Lower	2	8	4	3.25					24	23	2	2			5.75	7
Onahu Creek-Upper	1	0.25	0.25	36	9	9							8.33			
Paradise Creek	4	6.5	1.62	2	13	13							9.3			
Pettingell Lake	3	5	1.66	2	10	10							12			
Lake Solitude	2	2	1	2	4	4							10.5			
Spirit Lake	2	1.5	0.75	4					6	5					7.33	
Tonahutu Creek	2	6	3	4	1	1			23	23			4		6.65	
Lake Verna	2	2	1	7.5					15	13					7	
TOTALS	68	258.25			430	411	0	0	375	357	43	42				
AVERAGES			2.66	3.28									12.08		6.59	8.71

810 FISH RELEASED/ 848 FISH CAUGHT = 95.52% RELEASED

APPENDICES

Appendix 1.

COLORADO RIVER CUTTHROAT TROUT TAXONOMY REPORT
Bench Lake, Rocky Mountain National Park
1998--1999

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INTRODUCTION

Twenty four specimens of Colorado River cutthroat trout (*O. clarki pleuriticus*), one of four subspecies of cutthroat trout native to the State of Colorado, were evaluated for taxonomic purity at Colorado State University in 1998. Included in the analysis were 12 specimens collected from the inlet area of Bench Lake, and 12 specimens from Ptarmigan Creek approximately 1.5 2.5 km above the inlet to Bench Lake. Specimens are judged to be "pure" (A) Colorado River cutthroat trout with no detectable morphological difference between the sampling locations. A high degree of variability in spotting patterns within the collections is attributed to similar characteltristics of the source population

Colorado River Cutthroat Trout

The Colorado River cutthroat trout (referred to as CRN or Colorado River Natives by the Colorado Division of Wildlife) is the only trout or salmonine native to the upper Colorado River basin. Its native range extends southward to the Escalante River on the west and San Juan drainage on the east sides of the upper Colorado River basin; including the Green River, Yampa River, Gunnison River, Dolores River, San Juan River, and their associated tributaries. This is one of the larger natural ranges of a subspecies of cutthroat trout (exceeded only by *O. c. clarki* and *O. c. lewisi*). Access to the Colorado River basin was most likely achieved during colder, wetter periods associated with Pleistocene glaciation. Ancestral transfers most likely occurred via the upper Snake River basin, possibly the Bonneville basin, and it is very likely there were multiple invasions. Recent Molecular genetic information supports multiple invasions of Colorado River cutthroat trout (Shiozawa and Evans, Brigham Young University, personal communication)

The present distribution reflects isolation in the major river systems after initial colonization. This subspecies is presently known to occur as relict populations in Colorado, Wyoming, and Utah, though historic distribution most likely included northernmost parts of New Mexico and Arizona in the San Juan drainage (Behnke 1992). Most, or all of the remaining Colorado River cutthroat trout are found in small headwater streams, or alpine lakes, that have resisted colonization of non-native trouts due to the occurrence of some natural or artificial barrier to movement. Many of these populations are the result of transplants from one or more of several lakes in the Colorado River basin (Grand, Trappers, Grand Mesa, Stillwater etc.)

Though the historic distribution of *O. c. pleuriticus* was discontinuous as a result of thermal barriers in the lower portions of major river basins, it is likely that there was a significant amount of gene flow within major river systems. Each of these basins may therefore be viewed as containing historic "metapopulations" of Colorado River cutthroat trout with subtle accumulated genetic differences resulting from several thousand years of isolation. These genetic differences are manifest in morphological characters such as differences in spotting patterns observed between native trout of the upper and lower Green, Little Snake, Yampa, and Colorado rivers.

Bench Lake, and the drainage above it, in Rocky Mountain National Park, Colorado has served as refugia for a very unique population of "pure" CRN. This population was established in 1987 from about 300 individuals transplanted from Williamson Lake, California. The presence of "pure" CRN in California was the result of an interstate exchange of 30,000 fertilized trout eggs in 1931. It has been assumed that the genetic source of these cutthroat trout was Trappers Lake, located near the headwaters of the White River in Colorado (Martinez, 1988; Pister 1988). Trappers Lake has been one of the primary sources of egg taking operations of CRN in Colorado since 1919 (Wiltzius, 1987), though several other locations have been historically used to propigate CRN by State, Federal and private hatcheries as early as the 1890's (Wiltzius, 1987). The re-introduction of CRN to Bench Lake is documented by Pister (1988).

METHODS

Collection of specimens and preservation of tissue

Specimens were collected by gill nets and angling in early July 1998. Two separate collections were made, one from Bench Lake near the inlet, and a second group of individuals from Ptarmigan Creek approximately 1.5-2.5 km above the lake

It is assumed that two somewhat separate populations have been estblished as a result of the 1987 transplant. Preservation of tissue samples for various forms of DNA analysis is normally accomplished by freezing tissue, or whole specimens on dry ice or in liquid nitrogen or by using a fixative agent such as ethyl alcohol (ETOH)or 10% formalin. For the purposes of the present study, specimens were preserved in 100% ETOH . In addition, tissue samples preserved in ethyl alcohol were taken from approximately 60 individuals when the specimens were collected and spotting patterns were recorded on video tape. Some specimens were then permanently fixed in 10% formalin and stored in 40-50% isopropyl alcohol, to serve as a reference collection.

Classical Taxonomic data - basis of diagnosis

Cutthroat Trout

All populations were evaluated on the basis of morphological and meristic characters. Characters useful in identification for Colorado River cutthroat trout are summarized in Wernsman (1973) and Behnke (1992). These include number of scales in the lateral series and above the lateral line, number of pyloric caeca, number of basibranchial teeth, number of gill rakers on the first gill arch, number and degree of development of gill rakers on the posterior side of the first gill arch, spotting pattern, coloration, size and shape of parr marks, number of pelvic fin rays, and number of vertebrae.

For the Colorado subspecies of cutthroat trout the number of scales in the lateral series and above the lateral line are very diagnostic. Pure populations generally have means above 180-200 and 40-45 respectively (highest for greenbacks and lowest for Rio Grande River cutthroat). It may be assumed that all native Colorado populations of cutthroat trout have mean pyloric caeca numbers between 30-40 (somewhat higher for Rio Grande cutthroat). Numbers of gill rakers on the first arch are typically 17-21 with means of 18-19. Trappers Lake CRN have slightly higher gill raker numbers and moderately to well developed posterior gilll rakers. Based on the earliest collections, there is also a higher degree of variation in spotting pattern in Trappers Lake CRN. In addition to typical large, posteriorly concentrated spotting patterns, some individuals have more randomly distributed spotting patterns, and a small percentage with spots closely spotted even to the tip of the snout (Jordan 1891). Genetically pure cutthroat trout typically have basibranchial teeth. With the exception of a few populations of interior redband rainbow trout (*O mykiss gairdneri*) rainbow trout do not have basibranchial teeth. The occurrence of more than 5% - 10% of individuals without these small teeth in a population is a good indicator of historic gene flow with rainbow trout. Trappers Lake CRN have higher mean basibranchial teeth counts (Wernsman, 1973, Martinez, 1988).

based on the examination of thousands of specimens of cutthroat and rainbow trout, spotting patterns have proven to be very useful in taxonomic evaluation (Behnke 1992). This character is not amenable to quantification, and requires the judgement of an experienced observer. For evaluation of spotting patterns in this study, a series of spotting indices was used to evaluate the observed variability in spotting patterns of each specimen, and the results were interpreted for the sample as a whole. Individual specimens were rated for their overall spotting phenotype (Spt) from 1 to 5, where 1 represents a typical "pure" cutthroat spotting pattern, and 5 represents a typical "pure" rainbow spotting pattern. The size of spots (SptZ) was rated from 1 to 3, with 1 being relatively small and 3 greater than or equal to the diameter of the pupil of the eye. The total number of spots on the head (SptH) was counted for each specimen, and each sample was rated for uniformity among the specimens, or sample spotting index (SSI).

Differences in coloration, spotting, number of basibranchial teeth, and posterior gill raker development allow separation of native Colorado cutthroat trout from Yellowstone Lake cutthroat by an experienced observer (e.g. Marnell et al. 1987). Yellowstone cutthroat trout are yellowish brown, silvery, or brassy. Bright golden-yellow, orange or red colors that are typical of Colorado subspecies are absent in Yellowstone cutthroat. Millions of Yellowstone cutthroat were shipped to Colorado in the first half of the century, and Yellowstone Lake is assumed to be the source of possible introductions to Colorado (Varley 1979).

Identification of rainbow trout influence in a population of cutthroat trout is important because of the widespread stocking of hatchery propagated fish in the last century. Virtually all hatchery rainbow trout are derived from coastal rainbows (*O. mykiss irideus*). Coastal rainbow typically have 120-140 scales in the lateral series, with means around 130, and much higher pyloric caeca numbers (40-70 with averages about 55). Coastal rainbow trout also lack basibranchial teeth. Spotting patterns of rainbow trout are dramatically different from cutthroat, with an even distribution of spots across the body and numerous spots on top of the head. Parr marks of coastal rainbow trout are rounded as opposed to elliptical parr marks observed in cutthroat and interior redband rainbow trout. In addition, dorsal and ventral supplemental rows of parr marks present in cutthroat and interior redband rainbow are absent in coastal (hatchery) rainbow trout. Hybrids between rainbow and cutthroat trout were identified on the basis of meristic and morphological characters (scales in the lateral series and above the lateral line, pyloric caeca numbers, gill raker numbers, basibranchial teeth counts), types of parr marks and spotting patterns (Behnke 1992).

Populations are rated as "pure" (A) if all diagnostic criteria are in the expected range for the subspecies. A rating of "essentially pure" (A-) indicates the population is considered to be representative of the subspecies, but one or more of the diagnostic criteria is slightly outside the expected range. It is difficult to assess, in some cases, whether this is natural variability or due to multiple sources of the population. A rating of "good" (B) describes a population where obvious gene flow with another subspecies of cutthroat or rainbow trout is detectable, but the overall phenotype is characteristic of the native taxa. In some basins, "good" populations are all that remain of the native taxa, and these should be given special attention (e.g. Dowling and Childs 1992). Most of the cutthroat trout populations are also assigned a letter grade, or rating, to correspond to Binns (1977) and Martinez (1988), and DOW convention.

Diagnosis and Discussion

Specimens are judged to be "pure" (A) Colorado River cutthroat trout with no detectable morphological difference between the sampling locations. A high degree of variability in spotting patterns within the collections is attributed to similar characteltristics of the source population.

Ranges and means for diagnostic characters from the Bench Lake sampling location are scales in the lateral series 183 201 191 33 scales above the lateral line 41-50, 45.08, pyloric caeca numbers: 27-36, 30 75, total gill rakers 19 23 20 0 posterior gill rakers are vestigal to moderately developed (4-11, 7.17); all specimens have strongly developed basibranchial teeth (5 13 8 92) and spotting patterns of all 12 specimens are somewhat variable with a relatively wide range of size distribution across the body and concentration of spots. While the spotting patterns are generally more varialbe than typical Colorado River cutthroat trout, the characteristics are consistent with description of specimens collected in 1889 from Trappers Lake before any stocking of non-indigenous trout could have occurred. All twelve specimens have 9 pelvic fin rays

Ranges and means for diagnostic characters From Ptarmigan Creek location are: scales in the lateral series 184 206 193 92 scales above the lateral line 41-51,47.67; pyloric caeca numbers: 27-35, 30.42; total gill rakers 18-22, 19.92 posterior gill rakers are vestigal to moderately developed (4-11, 7.08); all specimens have strongly developed basibranchial teeth (6 16 9 83) and spotting patterns of all 12 specimens are similar to the specimens collected from Bench Lake, with a wide degree of variability in distribution and concentration toward the caudal region. Eleven of twelve specimens have 9 pelvic fin rays and one specimen has 8 pelvic fin rays (8-9, 8.92).

All specimens have well developed basibranchial teeth, either in a single row or in two rows along the basibranchial plate. The basibranchial teeth in these specimens are not characteristic of Yellowstone cutthroat trout which have numbers of individual teeth at or near 20. Posterior gill raker development is relatively consistent within the sample. All individuals have very week or moderately gill rakers on the posterior side of the first gill arch- generally 3-7 weak or moderate rakers on the lower arch at the bottom, and 2-3 weakly developed rakers on the upper arch. This character depicts the population as likely being founded from a few number of individuals- as there is a relatively high degree of uniformity within the collection. Coloration is consistent within the collection. Individuals have orange to red-orange hues in the ventral portions of the body, on the ventral fins, and in some individuals in patches along the lateral line. No brassy or purple coloration characteristic of Yellowstone cutthroat trout is present in the collection.

The combination of high scale counts, low pyloric caeca numbers, well developed bsasibranchial teeth, gill raker numbers, weak to moderate posterior gill raker development, spotting and coloration characteristics consistent with early Trappers Lake collections and pelvic fin ray counts leave little doubt that these are indeed "pure" Colorado River cutthroat trout. It is possible, however, that some of the observed variability is the result of multiple sources used in egg taking operations for Colorado River cutthroat trout in 1931. During that part of the century several lakes on Grand Mesa were also used as a source for eggs. If records indicate that other lakes besides Trappers Lake produced eggs in 1931, it is very likely that there was a mixing at the hatchery, and the original Williamson Lake CRN may have been from multpile sources.

Table 1. Individual values, Ranges, and Means for diagnostic characters used to evaluate the collection of trout from Bench Lake (BL98 1-12) and Ptarmigan Creek (PC98 1-12) Rocky Mountain National Park, Colorado. Individuals are listed by coded collection number. Characters are total length (TL), scales in the lateral series (SII), scales above the lateral line (Sal), Spot index (SI), Spot size (Ssz), Number of spots on the head (SH), pyloric caeca numbers (PC), gill rakers on the first gill arch (lower/upper total), basibranchial teeth (BBT). Posterior gill rakers on the first gill arch are counted and designated v=vestigial, w=weak, m=medium or s=strong development. Sample Spot Index rates the variability of spotting characteristics within the sample on a scale of 1-5 were 1 represents complete uniformity, 2 noticeable variation, 3 = mostly intermediate spotting characteristics, 4 = widely distributed spotting characteristics within the sample, and 5 represents a complete range from cutthroat to rainbow phenotypes in the collection.

Bench Lake:

Specimen Number	Total Length mm	Scales: Lateral Series	Scales: above Lateral Line	Spot Index	Spot Size	Spots on Head	Pyloric Caeca	Basibran-chial Teeth	Gill Rakers Bottom/ Top: Total	Cutthroat Mark	Post. Gill Rakers	Pelvic Fin Rays
BL98-1	189	191	46	1+	2	0	31	10	7/12:19	YES	1v,2w	9
BL98-2	193	198	44	1+	3	0	29	5	12/7:19	YES	1v,5w	9
BL98-3	215	201	47	1+	2+	0	29	12	12/7:19	YES	7m,3w	9
BL98-4	185	189	43	1	3	0	32	9	12/8:20	YES	4v,3w	9
BL98-5	190	196	45	1	2+	2	27	9	13/7:20	YES	3v,3w	9
BL98-6	219	194	46	1+	3	0	31	11	13/8:21	YES	6v,3w	9
BL98-7	189	183	41	1+	2+	4	27	8	12/7:19	YES	4w,3w	9
BL98-8	192	199	44	1+	2	0	31	13	12/7:19	YES	2v,2w	9
BL98-9	221	192	43	1+	2+	0	32	7	8/13:21	YES	3w,3w	9
BL98-10	195	189	45	1+	3	0	28	8	12/7:19	YES	5m,3w	9
BL98-11	196	204	50	1+	2	0	35	8	9/14:23	YES	7m,5w	9
BL98-12	206	196	47	1+	2+	0	34	7	7/13:20	YES	3w/4 w	9
Range	185 221	183 204	41-50	1- 1+	2-3+	0-4	27-36	5-13	19-23	/	4-11	9
Mean	**199.17**	**194.33**	**45.08**	/	/	/	**30.75**	**8.92**	**20.0**	/	**7.17**	**9**
StDev	**12.71**	**5.88**	**2.35**	/	/	/	**2.90**	**2.27**	**1.21**	/	**2.04**	/

Sample Spot Index = 1-

Ptarmigan Creek

Specimen Number	Total Length mm	Scales: Lateral Series	Scales: above Lateral Line	Spot Index	Spot Size	Spots on Head	Pyloric Caeca	Basibran-chial Teeth	Gill Rakers Bottom/ Top: Total	Cutthroat Mark	Post. Gill Rakers	Pelvic Fin Rays
PC98-1	195	203	51	1+	2+	0	33	9	9/13:22	YES	3v,2v	9
PC98-2	205	188	44	1+	3	0	31	9	12/7.19	YES	3v,3w	9
PC98-3	196	184	46	1+	3	2	28	8	127:19	YES	4v,5w	9
PC98-4	186	200	40	1	2+	0	28	10	13/8:21	YES	3v,4w	9
PC98-5	184	191	43	1+	2+	0	32	14	12/8:19	YES	4v,3w	9
PC98-6	188	195	44	1+	3	0	35	12	11/8:19	YES	6w,7w	9
PC98-7	192	196	47	1-	3	4	26	8	12/7:19	YES	4w4w	8
PC98-8	188	190	46	1+	2	0	31	6	13/7:20	YES	2v,3w	9
BL98-9	204	202	41	1+ -	2+	0	27	8	11/7:18	YES	4v,6w	9
PC98-10	206	186	45	1	2	0	34	11	11/7:18	YES	3w,4w	9
PC98-11	187	194	46	1	3	0	28	16	13/8:21	YES	2w,2w	9
PC98-12	196	191	43	1	3	2	33	7	13/9:22	YES	3v,3 w	9
Range	184-206	186-203	41-51	1- 1+	2-3	0-4	27-35	6-16	18-22	/	4-11	8-9
Mean	193.92	193.33	44.67	/	/	/	30.42	9.83	19.92	/	7.08	8.92
StDev	7.76	6.14	2.90	/	/	/	3.09	2.95	1.31	/	2.31/	0.29

Sample Spot Index 1

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Appendix 2. 1998-1999 Taxonomy Table

Summary of Taxonomic evaluation of cutthroat trout populations from Rocky Mountain National Park collected in 1998 and 1999. Taxonomic assessments are based on restriction fragment length polymorphism (RFLP) haplotype patterns of mitochondrial DNA cytochrome b gene and RFLP genotype patterns of nuclear ITS1 gene. Diagnosis is from tissue samples and photographs only except for collections from Fifth Lake and Ypsilon Lake where number of specimens analyzed by classical taxonomic methods is followed by *Sp*. Species referred to in Diagnosis are: Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*- Ocp), greenback cutthroat trout (*O.c. stomias*- Ocs), Yellowstone cutthroat trout (*O.c. bouveri* -Ocb) and cutthroat trout of unknown taxonomic affinity Oc?. Rating is intended to be consistent with morphological rating system developed by Binns (1977). Comments indicate characteristics of the population inferred from DNA analysis are: Multiple Sources for the population (MS); Single Source for the population (SS); No rainbow trout haplotypes or genotypes present in the sample (NoRBT); rainbow trout haplotypes or genoytpes present in the sample (RBT); haplotypes assumed to be derived from Yellowstone cutthroat trout (probable Yellowstone cutthroat influence) (pYCT); and phenotypic variability (PV) depicted primarily in coloration and spotting patterns from photographs and slides. Percentages given following pYCT and pRBT are estimates based on the frequency of haplotype patterns and are only given as a rough indicator based on this analysis alone.

Location/Year	Code	Number	Diagnosis	Comments
Fifth Lake 98'	5th	10 4S	Ocp A-	MS NoRBT
Columbine Cr 98'	CC	12	Ocp A-	MS PV NoRBT
Paradise Cr 98'	PC	17	Ocp A-	NoRBT
Paradise Cr 99'	PL	14	Ocp A-	NoRBT
Paradise Park 99'	PP	15	Ocp B	MS pYCT-10% pRBT-10% PV
Paradise Cr Lake 99'	BN	6	Ocp B+	MS pYCT-30%
Timber Lake 98'	TM	16	Ocp A	SS NoRBT
Onahu Cr 99'	ON	15	Ocp A-	MS NoRBT PV
North Inlet 99'	NI	17	Ocp B	MS pYCT-30%
Haynach Lake 99'	HY	15	Ocb B	MS pYCT 80% PV
Ypsilon Lake, Cr 98'	YP	12 20S	Ocp A-	MS NoRBT pYCT-10%
Ypslion Cr 99'	YP	15	Ocp B+	MS NoRBT pYCT-10%

Arrowhead Lk 98'	AR	11	Ocs A-	NoRBT pYCT-5%
Lake Haiyaha 98'	HA	12	Ocb B	MS pYCT-80%
Thunder Lk 98'	TH	25	Oc? B	MS pYCT-10% pRBT-10%
Pettingill Lk 99'	PG	15	Oc? B+	MS pYCT-30% pRBT-10% PV
Willow Cr 98'	WL	15	Oc? B+	MS pYCT-20% PV
Sandbeach Cr upper 99'	SU	15	Ocs A-	MS pYCT-5% NoRBT
Sandbeach Cr lower 99'	SL	15	Ocs B+	MS pYCT-20% NoRBT
Glacier Cr	GC	15	Oc? B+	MS pYCT-20% NoRBT
Gorges Lake Dr. 99'	GL	15	Oc? B+	MS pYCT-10% NoRBT
Forest Canyon 99'	FC	15	Ocs A-	MS NoRBT PV
Caddis Lk 99'	CD	15	Ocs A	SS NoRBT
Hague Cr 99	HGC	3	Oc? A-	(small sample size)
Hague Cr-Hazeline 98'	HG	15	Oc? B+	MS NoRBT pYCT-20%

Appendix 3. Binns Rating System for Fish Taxonomy

Developed by Dr. Niles Binns of Wyoming Game and Fish Department in 1977 (Trotter 1987)

A - Pure stock.

B - Essentially pure. Only a trace of hybrid influence detectable in the meristic characters or, if no hybridization is detectable, there is some history of stocking the water with non-native species.

C - Hybrid influence obvious from meristic characters but not yet from physical appearance. Phenotypically a "good" representative of the subspecies but genotypically only about 75 percent pure.

D - Definite hybrid evident from meristic characters but still externally a "good" representative.

E - Population not examined by a taxonomist.

F - Obvious hybrid in appearance; a poor representative of the subspecies.

+ and - used to denote intermediaries between above ratings.

Only A populations, the purest stocks, are used for establishing new populations.

Appendix 4. RMNP Fishing Regulations, page 1

Rocky Mountain

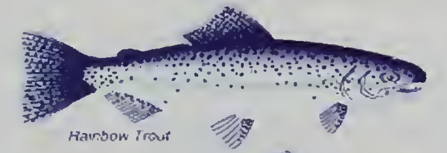
National Park
Colorado

National Park Service
U.S. Department of the Interior

Fishing

1998 Information

Sport fishing is permitted in Rocky Mountain National Park, a protected area. Fishing activities are balanced with efforts to restore and perpetuate natural aquatic environments and life.



Fishing was popular with early settlers in the Rocky Mountains. In an attempt to improve the sport, they stocked many streams with non-native species of trout and moved trout to lakes and streams that lacked them. The only trout native to the park were the greenback cutthroat and the Colorado River cutthroat. The National Park Service stocked non-native Yellowstone cutthroat trout as late as 1968.

These efforts to enhance recreational opportunities in National Park areas have been reconsidered. Since 1975, exotic or non-native fish have been removed and native greenback cutthroat and Colorado River cutthroat trout are being restored to park waters.

TODAY'S FISHERIES

Populations of at least four species of trout exist in the park -- brown, brook, rainbow, and cutthroat. Some suckers also inhabit the streams and lakes. Only 48 of the 156 lakes in the park have reproducing populations of fish. Cold water temperatures and lack of spawning habitat prevent reproduction in high altitude lakes. Supplemental stocking is done only to restore native species to altered waters. Fishing success at high altitudes varies, even from waters known to contain fish. Restoration efforts have kept the possession limits to a minimum, and have resulted in increased trout populations in many areas within the park.

See POSSESSION LIMIT for specific regulations. *You must be able to identify each species of fish taken.*

LICENSES & FEES

A valid Colorado fishing license is required for all persons 16 years of age or older.

A Colorado State fishing license is required to fish in Rocky Mountain National Park. No other permit is necessary, however, special regulations exist.

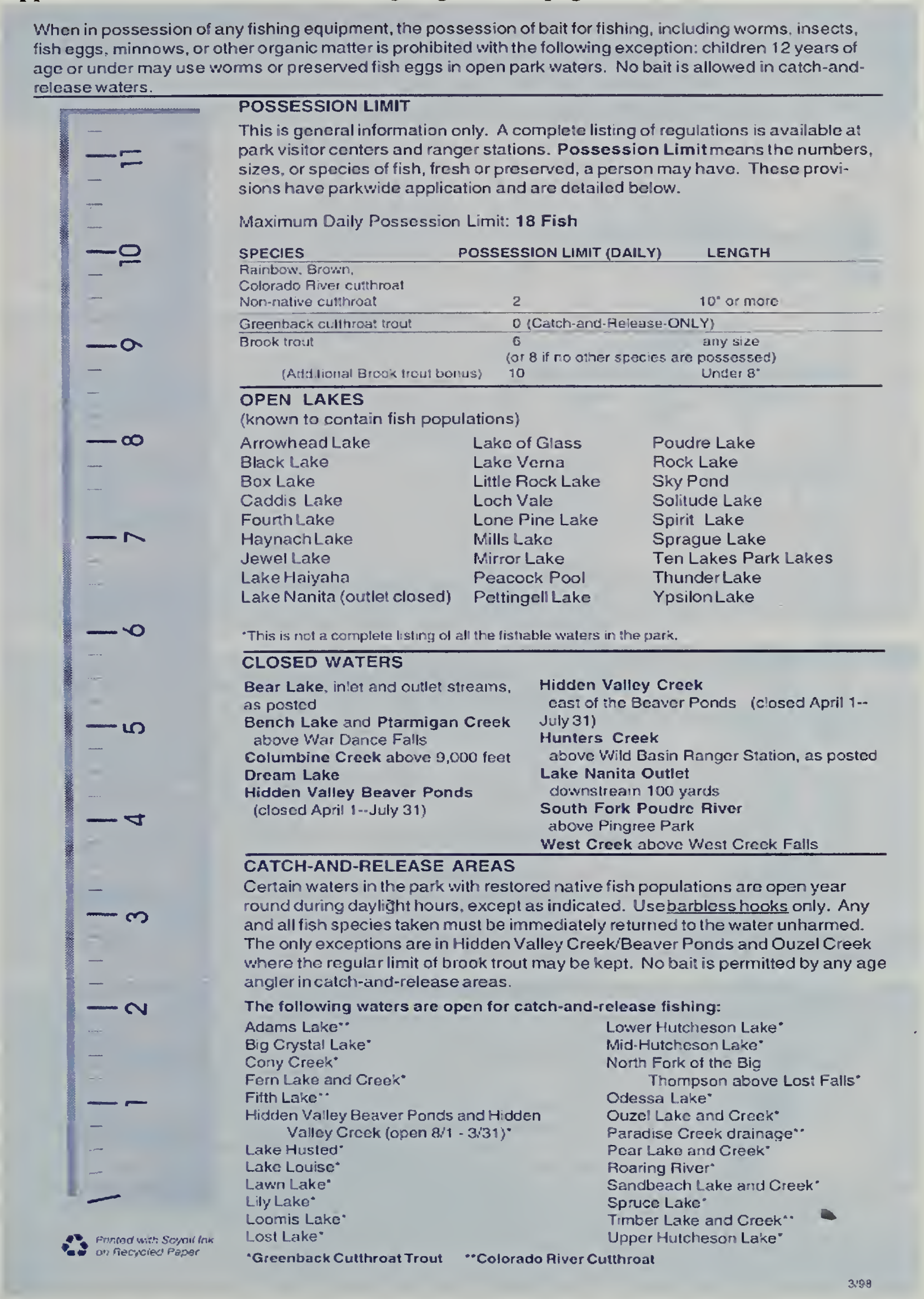
It is your responsibility to know and obey them.

	RESIDENT	NON-RESIDENT
Annual	$20.25	$40.25
Senior Annual Fishing (64 years or older and a Colorado Resident, only)	$10.25	
Five-day license	$18.25	$18.25
One-day license	$ 5.25	$ 5.25

METHOD OF CAPTURE

Each person shall use only one hand-held rod or line. Only artificial lures or flies with one (single, double, or treble) hook with a common shank may be used. "Artificial flies or lures" means devices made entirely of, or a combination of materials such as wood, plastic, glass, hair, metal, feathers, or fiber, designed to attract fish. This does not include: (a) any hand moldable material designed to attract fish by the sense of taste or smell; (b) those devices less than one and one-half inch in length to which scents or smell attractants have been externally applied; (c) molded plastic devices less than one and one-half inch in length; (d) foods; (e) traditional organic baits such as worms, grubs, crickets, leeches, minnows, and fish eggs; and (f) manufactured baits such as imitation fish eggs, dough baits, or stink baits.

Appendix 4 continued. RMNP Fishing Regulations, page 2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When in possession of any fishing equipment, the possession of bait for fishing, including worms, insects, fish eggs, minnows, or other organic matter is prohibited with the following exception: children 12 years of age or under may use worms or preserved fish eggs in open park waters. No bait is allowed in catch-and-release waters.

POSSESSION LIMIT

This is general information only. A complete listing of regulations is available at park visitor centers and ranger stations. **Possession Limit** means the numbers, sizes, or species of fish, fresh or preserved, a person may have. These provisions have parkwide application and are detailed below.

Maximum Daily Possession Limit: **18 Fish**

SPECIES	POSSESSION LIMIT (DAILY)	LENGTH
Rainbow, Brown, Colorado River cutthroat Non-native cutthroat	2	10" or more
Greenback cutthroat trout	0 (Catch-and-Release-ONLY)	
Brook trout	6 (or 8 if no other species are possessed)	any size
(Additional Brook trout bonus)	10	Under 8"

OPEN LAKES
(known to contain fish populations)

Arrowhead Lake
Black Lake
Box Lake
Caddis Lake
Fourth Lake
Haynach Lake
Jewel Lake
Lake Haiyaha
Lake Nanita (outlet closed)
Lake of Glass
Lake Verna
Little Rock Lake
Loch Vale
Lone Pine Lake
Mills Lake
Mirror Lake
Peacock Pool
Pettingell Lake
Poudre Lake
Rock Lake
Sky Pond
Solitude Lake
Spirit Lake
Sprague Lake
Ten Lakes Park Lakes
Thunder Lake
Ypsilon Lake

*This is not a complete listing of all the fishable waters in the park.

CLOSED WATERS

Bear Lake, inlet and outlet streams, as posted
Bench Lake and Ptarmigan Creek above War Dance Falls
Columbine Creek above 9,000 feet
Dream Lake
Hidden Valley Beaver Ponds (closed April 1--July 31)
Hidden Valley Creek east of the Beaver Ponds (closed April 1--July 31)
Hunters Creek above Wild Basin Ranger Station, as posted
Lake Nanita Outlet downstream 100 yards
South Fork Poudre River above Pingree Park
West Creek above West Creek Falls

CATCH-AND-RELEASE AREAS

Certain waters in the park with restored native fish populations are open year round during daylight hours, except as indicated. Use barbless hooks only. Any and all fish species taken must be immediately returned to the water unharmed. The only exceptions are in Hidden Valley Creek/Beaver Ponds and Ouzel Creek where the regular limit of brook trout may be kept. No bait is permitted by any age angler in catch-and-release areas.

The following waters are open for catch-and-release fishing:

Adams Lake**
Big Crystal Lake*
Cony Creek*
Fern Lake and Creek*
Fifth Lake**
Hidden Valley Beaver Ponds and Hidden Valley Creek (open 8/1 - 3/31)*
Lake Husted*
Lake Louise*
Lawn Lake*
Lily Lake*
Loomis Lake*
Lost Lake*
Lower Hutcheson Lake*
Mid-Hutcheson Lake*
North Fork of the Big Thompson above Lost Falls*
Odessa Lake*
Ouzel Lake and Creek*
Paradise Creek drainage**
Pear Lake and Creek*
Roaring River*
Sandbeach Lake and Creek*
Spruce Lake*
Timber Lake and Creek**
Upper Hutcheson Lake*

***Greenback Cutthroat Trout** ****Colorado River Cutthroat**

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